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ENGINEERING NEWS-RECORD

A Consolidation of Engineering News, Engineering Record, The Sanitary Engineer, and the Contractor

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CABLE ADDRESS: "MACHINIST, N. Y."

Published weekly. $5 per year. 25 cents per copy. Entered as second-class matter April 11, 1917, at the Post Office at New York, N. Y., under the Act of March 3, 1879. Printed in U. S. A.

Member A.B.C.
Member A.B.P.

NUMBER OF COPIES PRINTED THIS ISSUE, 30,716

NEW YORK District Office, 285 Madison Avenue
WASHINGTON, National Press Building
CHICAGO, 520 N. Michigan Ave.
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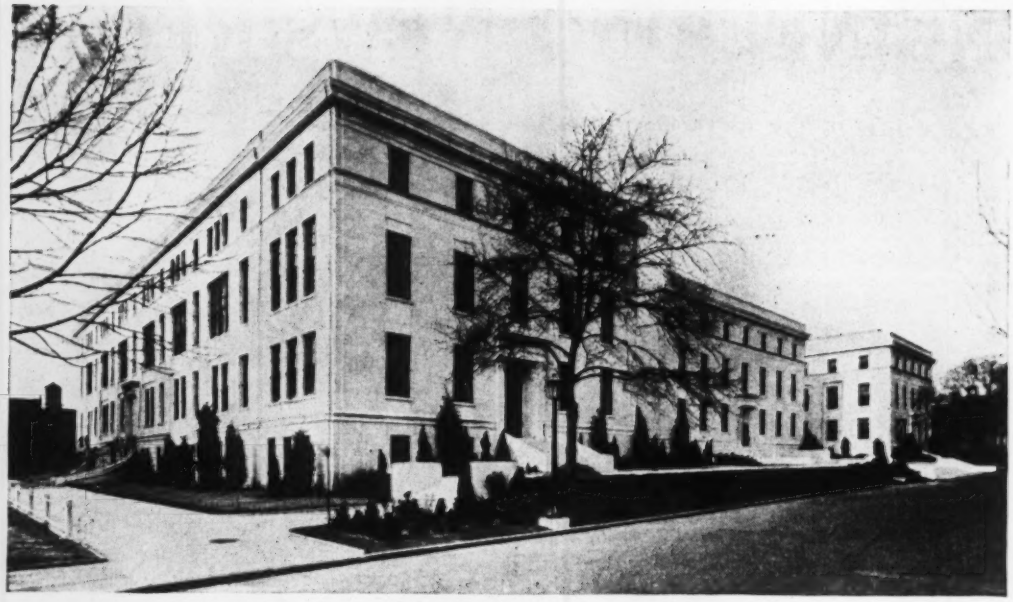

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ENGINEERING NEWS-RECORD

A McGRAW-HILL PUBLICATION — ESTABLISHED 1874

DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

F. E. SCHMITT, *Editor*

Volume 106 NEW YORK, JUNE 18, 1931 Number 25

Tunnel Against Bridge

TWO apparently unrelated events of the current week bring the question of tunnel against bridge into sharp illumination. Once again the War Department has rejected an application for approval of clearances for a bridge over the Hudson River at 57th St., New York, a project whose origins go back fully forty years and that has contended with innumerable antagonisms. This rejection sets back the prospect of realization of the project most seriously, but leaves its fundamental claims to consideration unweakened, since its great capacity for moving a necessary traffic of huge volume assures its retaining a place in transportation planning. The rejection, however, has brought out many formidable elements of opposition to such a bridge and indicates clearly that at the moment a large body of opinion is partisan to tunnels, both for railway and for highway traffic. Interestingly enough, a few days after the War Department decision a report on plans for a vehicle tunnel crossing the East River and the full width of Manhattan was made public, the project being intimately related to the proposed Hudson River vehicle tunnel of the Port of New York Authority and indeed necessary for the success of the latter enterprise. These two projects, totaling about two hundred millions in cost, have good prospect of moving toward construction rapidly. Money and support, both legislative and popular, are not hard to find for tunnel projects, even unprecedentedly costly ones; comparable bridge projects for the time being are in eclipse.

Traffic Complexities Extraordinary

INTEREST in the remarkable Queens-Manhattan tunnel project lies not only in its huge cost and its doubtful earning capacity but also in the extraordinary complication introduced by a proposed intermediate station near Second Ave. This introduces a new idea to tunnel history. The complication arises from a belief that underground traffic streams cannot safely be merged or divided unless they are first disintegrated into their traffic atoms, and leads to the strange device of circling straightaway traffic through a great loop tunnel. This loop tunnel is the means of bringing traffic up near the surface to an open plaza, but it does so only at the cost of half a mile of extra distance and probably much more than corresponding loss of time. So novel is this feature that the project is unlikely to go far toward execution until it has had thorough restudy; it is with scrutiny by men of wide experience in the practical complications of handling streams of dense vehicle traffic. The problem of underground junctions is one of serious difficulty, as is evident on considering the difficulties of surface-road junctions, uncomplicated by the alarming possibility of underground traffic confusion. But if the problem can be solved only by so intricate a mechanism as the costly, time-wasting and dangerous circular tunnel, the possibilities of tunnels as motor-vehicle thoroughfares will be seriously limited.

Inept Lawmaking

ASTONISHING legislative ineptness appears to have prevailed throughout the three years of effort made by the people of Iowa to refinance their state highway system. A sequence of legislative acts has been promptly abrogated by a succession of court decisions as described in the news section of this issue. First a bond-issue law was enacted that violated the state constitution. Then an amendment to the constitution, twice acted on, was so written that the courts could not do otherwise than declare it invalid. Fortunately this inability of legislation to express the will of the people will not keep them from having roads. The roads represented by the abortive hundred-million-dollar bond issue have already been constructed, on money raised through county bond sales; the proposed issue of state bonds was a refunding issue which would have transferred the aggregate county road bond debt to the state and thereby would have bettered the financial position of the commonwealth. Now that the refunding has been estopped, the counties will be hampered in further highway financing and development, and extension and improvement of the state road system will be retarded. Criticism is futile, of course; but few of those who have followed the energetic efforts of the state road engineers for half a generation to bring Iowa from dirt roads to a state-wide paved road system can forbear wishing that they had been supported by more capable lawmakers and legal advisers.

Water Purification Ascendant

IS THE water-works profession in danger of losing perspective as to the relative importance of purification in water-supply engineering? The last two annual conventions of the American Water Works Association suggest that such is the case. The 1930 meeting at St. Louis gave a larger share of the program space than ever before to purification topics. At the Pittsburgh convention the meetings of the purification division usually had capacity attendance, while at several meetings of the "main session" exhortations to the members to "come closer to the platform" would have been in perfect order. Apparently discussions of taste-removal methods had greater appeal to the attending members than did the subject of adequate supply during the recent drought, or developments in the design of elevated tanks. The explanation may be that purification methods are developing more rapidly than the practice of water supply.

or it may be found in the fact that purification men are more articulate than their colleagues of the supply and distribution service. But purification is secondary after all: white-coated filter attendants or laboratory technicians can never compensate for inadequate distribution systems or excessive pumping costs.

Are Design Revisions Necessary?

A FURTHER example of the danger of losing perspective in water-supply engineering was given by the recent Pittsburgh convention of the American Water Works Association, where the discussion of adequacy of supply during drought periods, which should have been the most important subject on the entire program, proved disappointing. Four prepared discussions were presented, only one of which addressed itself squarely to the subject without digression into individual experience. In that one presentation, by N. T. Veatch, Jr., the opinion was advanced and capably argued that the factor of safety inherent in good water-supply design practice is adequate even for periods of extreme rainfall shortage. Although the prevailing opinion seems to be at variance with that stand, Mr. Veatch's argument really suffered from the absence of any expression of a contrary opinion. Can it be that intense concentration by engineers on the immediate problem of design has limited their thinking to discrete cases and has handicapped their powers of generalization? Surely the hectic experiences of 1930 should give rise to more important expression than mere reminiscence.

$243,560,000 for Sanitation

COMPREHENSIVE indeed is the 30-year sewage-treatment program for the improvement of sanitary conditions in New York harbor that has been submitted to the city authorities by the department of sanitation. If put into effect, all sewage entering the harbor from within city limits would receive treatment, the degree depending upon which of three proposed plans is adopted. Construction of 33 plants at a cost of $243,560,000 is recommended by the department in order to restore boundary waters to the condition that obtained in 1905. The cost appears formidable, yet it amounts to only $16.59 per capita of equivalent population, and would be spread over a 30-year period of construction. Fortunately, no definite decision need be made at the present time; the program is so prepared that each plant may be taken up and considered as a unit. But this feature of the plan is not all advantage; lacking the spur of a definitely adopted program, the tendency will be to permit a lag in its execution under the ever-present competition of other needs for city funds. For this reason a forthright adoption of a definite policy by the city authorities would be of real value.

Where Simplicity Counts

VEHICLE tunnels in Europe are not new, but one designed and built after the pattern of the Holland tunnel in this country, such as is to be built at Antwerp, as described in this issue, is none the less notable. The adopted design not only followed current American practice but was prepared by experienced tunnel engineers from this country in collaboration with a French contractor. Many alternate plans for the project were submitted by the numerous bidders, and most of them were accompanied by elaborately detailed drawings. That submitted by the successful bidder was accompanied by only two blueprints, showing general plan, profile and sections. The whole project was there simply presented. The engineers who prepared the proposal understood the problem before them and in addition understood the value of simplicity in presenting such a proposal to laymen. Confident that they could prepare the elaborate detailed drawings at a later date without finding then that they had overlooked important details, they went to the commissioners with simple drawings which could be understood. They won the day.

Plan for Fall and Winter!

MIDSUMMER is close at hand. The large budget of public-works construction with which the year opened has been pushed steadily toward execution and contract lettings in this field have passed their peak. Private construction and business generally have hardly come up to the moderate activity that was expected, and are picking up with disappointing slowness.

What is the outlook for fall and winter activity? Business may revive, may even become decidedly active, but also it may not; and in view of present facts the safest assumption is that public enterprise will again be a large factor in keeping down unemployment. And this in turn means that now is the time for planning the works on which fall and winter construction must rely. Under the circumstances an extraordinary measure of responsibility rests on public governments.

It is three months since the McGraw-Hill platform for business was published. Every event during that time has confirmed and emphasized its value. The two chief planks—maintenance of living standards and long-time advance planning—have never had greater meaning than today; and under the conditions of the moment they address themselves even more insistently to public than to private authorities. Development of plans for public works, and their advance without delay to the working stage, offers the only dependable prospect for reasonably maintained earning power toward the close of the year. These present summer months, then, offer the golden opportunity for lightening the winter's burdens.

Our platform proposed long-time planning, but in public works the idea of a far-distant program is too new to have much practical meaning now. We cannot wait for the comprehensive plans that would be needed, or stop to quarrel over their frequent weaknesses and unacceptable idealism. But this much can be done: Every public improvement that is reasonably urgent can be based on an outlook of three to ten years, and so adjusted that its magnitude and its correlation with associated projects will fit this perspective—not an impossible or seriously difficult task. To this extent the development needs of some years ahead can be foreseen and provided for.

Local governments all through the country were burdened with severe employment and relief problems last winter. No one can now foresee the coming winter's problems, but the experience of the last one may nevertheless be taken as a warning. Work was not ready, but often had to be made; and attempts to make work were haphazard and generally of poor effect. We should not have to rely on similar devices again, come what may. We need not, if planning is taken in hand now and an ample program for fall and winter construction laid

down. If private business becomes active by then, no harm will have been done; if it does not become active, a very realistic situation will be saved.

Carrying out such programs does not face insuperable difficulties with respect to financing. Legislatures can be called to action. Will this mean more taxation? By no means, for all proper public developments can be built on bonds, which serve to put idle capital to work instead of cutting down present consumer resources. But in any event the community will not be worse off, for it will spend on useful construction what otherwise would be needed for idle relief measures.

Thus, finances are not the essential problem. Timely planning is the crucial thing. Every public improvement needs time before it reaches the working stage, and the lag cannot always—perhaps not usually—be eliminated. But in the conditions that now confront us quicker planning and better coordination are vital. It is for the present summer to bring them about, if we would be prepared for the problems of the coming fall and winter.

A New Mississippi Problem

CONGRESS, when it convenes in December, will have before it again the problem of flood control on the Mississippi River. This problem has become more complex since the House and Senate in 1928 acted conclusively, as they thought, in adopting the plan presented by the late Major Gen. Edgar Jadwin, then Chief of Engineers of the army. During these three years the essential economic assumption of the Jadwin plan, that there would be no cost for floodway land damages, has been opposed by the valley land owners and denied by the courts. A revision of plan has to be considered by Congress. What information is available as a basis for the exercise of wise judgment by the national legislature in this trying task?

It is notorious that the economics of Mississippi River flood control continue unstated by authority. In all the reports and testimony that have passed through the government printing office since 1927 one finds no definite estimate of the expenditure warranted to control floods in the alluvial valley of the Mississippi, and no official figures on the cost of complete control. Neither the Jadwin report of 1927 nor that of the reviewing board of engineers told the public anything more than that *the physical construction work of a specified plan* may be accomplished for a sum between $293,000,000 and $340,000,000. The report of Major Gen. Lytle Brown, present Chief of Engineers, laid before Congress in February, merely asserts that if the plan is modified in certain specified ways the work will cost certain sums more—so much more as to be unwarranted.

Thus Congress has not received from its official engineering advisers the knowledge that it needs in deciding the question of revision. When it meets it will know no more about what flood protection is worth or what safe flood protection will cost than was known before the 1927 inundation. It does know, however, that the original plan, which ignores land-damage costs, will not have the consent of the people of the valley. It also knows that if land damages are included the work cannot be completed within the estimated expenditure. Whether the cost then will rise to twice $340,000,000 (as the Mississippi River Commission originally estimated) or to three or four times that sum (as others have prophesied) is wholly speculative.

The public very urgently needs a definite answer. It needs to know, too, what the value of protection may be. All 48 states are committed to the expense—not merely the four states which are subjected to the inundation of a small portion of their territory. The issue is the personal concern of every citizen from sea to sea, not the private affair of Washington, New Orleans and Vicksburg. Each household in the land contributes ten to thirty dollars to the work; the constituents of each Congressman must pay a million or two. They are entitled to the full facts.

With a billion dollar expenditure in prospect, is the present plan the best that engineers can devise for the investment? Are not some of the reservoir or straightening plans, heretofore eliminated from the official picture, worth considering? Some of these are the ideas of capable engineers, and off-hand dismissal is not going to satisfy the engineering and business world that they are unsound. Too many criticised points exist in the engineering and economics of the present plan to warrant, without its careful reconsideration, much greater expenditure than Congress had been induced to believe would assure complete protection.

That the existing plan is satisfactory to the army engineers—it has never been reviewed by independent authorities—should nevertheless not discourage sharp scrutiny by Congress of its every detail. This should include its floodway planning, weir construction and levee design, and particularly the possibilities of reservoir control and channel rectification and protection. With the possibility of much greater expenditure than was originally estimated all of these elements assume a new aspect as design problems. If, for example, floodway land damages have to be paid, as it now seems certain they must be, then a higher and stronger levee which will eliminate a floodway may demand the consideration that it otherwise might not deserve. In brief, the question to be answered is: Admitting what the army engineers assert, that the present plan is the best that can be devised to cost $325,000,000, is it the best if twice or three times that amount has to be invested to provide effective protection?

Regardless of any fault of planning or merit of detail in the present plan, a legitimate charge of neglect lies against Congress and its engineering advisers for failure to determine and state clearly the economics of flood control on the lower Mississippi River. It is not hard to understand why at first, just after the disastrous flood of 1927, when factors affecting human life and the preservation of homes dominated all flood-control thinking, the cold economics of the problem could be overlooked. But since then there has been ample time for calm appraisal. The flood-control problem is primarily economic and only in a secondary sense engineering. Its economics should long before now have been clearly stated. The Jadwin plan should have been taken for what it really was, a preliminary reconnaissance outlining a course along which the working out of an ultimate solution of flood control was to be sought. Instead it was accepted as an unchangeable creation, one that must be preserved inviolate.

With the economic basis of the plan shattered by public sentiment and court decisions, revision is being undertaken in utter ignorance of essential economic facts. The situation is not a credit to engineering vision and perception and it should be corrected. Congress in its action on flood control during the coming session should make such correction its first demand upon its engineers.

Design and Construction of Two New Reclamation Dams

The Gibson concrete-arch dam and the Echo earthfill dam on government irrigation works—Tunnel and channel spillways—Elaborate equipment for testing pressure, temperature and seepage in concrete dam

IN THE irrigation works undertaken by the federal government there are a number of dams of moderate dimensions and various types that present their own special features in design and construction and that in this respect are perhaps of equal interest with the more spectacular structures of exceptional or even extraordinary size. Two dams that may be classed as of moderate dimensions and that represent two distinct types of structures on these irrigation projects are described below. Both of them were completed during 1930. The Gibson Dam, in Montana, is of the concrete-arch type, 195 ft. high and built on solid rock. The Echo Dam, in Utah, is of the earthfill type, 151 ft. high and built on a clay, gravel and sand formation. Their design and construction were under the direction of R. F. Walter, chief engineer, U. S. Bureau of Reclamation, and J. L. Savage, chief designing engineer; Ralph Lowry was construction engineer for the Gibson Dam, and F. F. Smith for the Echo Dam. All the activities of the bureau are under the general direction of Elwood Mead, commissioner of reclamation, U. S. Department of the Interior.

Gibson Dam—Concrete-Arch Type

A reservoir 6 miles long and storing 90,000 acre-ft. of floodwater for the Sun River irrigation project is formed by the Gibson Dam on the north fork of the Sun River about 25 miles northwest of Augusta, Mont. This dam, Fig. 1, is of the concrete-arch type, with a maximum height of 195 ft. and a crest length of 960 ft. Its spillway is designed to discharge 50,000 sec.-ft. before the water reaches the crest of the dam, while the maximum floodflow on record is 32,000 sec.-ft., in 1916.

Design of Dam—Special features of interest in this dam include: (1) extensive means for measuring and relieving any uplift pressure; (2) equipment for measuring the variations in temperature of the concrete at various locations, the magnitude of load and temperature strains and the radial deflections; and (3) a combined shaft and tunnel spillway 29½ ft. in diameter, with a funnel-shaped intake at the head of the shaft. The upstream face is vertical and has a uniform radius of 405 ft. The downstream face has a varying slope from top to bottom and from crown to abutments, while its radius reduces from 390 ft. at the top to 201 ft. at 195 ft. below the crown. Its thickness at the center increases from 15 ft. at the top, or El. 4,725.50, to 87 ft. at El. 4,530. Typical features are shown in Figs. 2 and 3.

This dam was designed by the trial-load method developed by the engineers of the U. S. Bureau of Reclamation, as described in the *Transactions* of the American Society of Civil Engineers, Vol. 93, 1929, pp. 1,191 and 1,289. No tensile stress was considered, the entire load being carried by compressive stresses in both the arch and cantilever elements. Uplift was assumed to range from full reservoir pressure at the upstream face to zero, or tailwater pressure, at the downstream face, these pressures being applied to half the horizontal area of the base and of the concrete section at any elevation investigated.

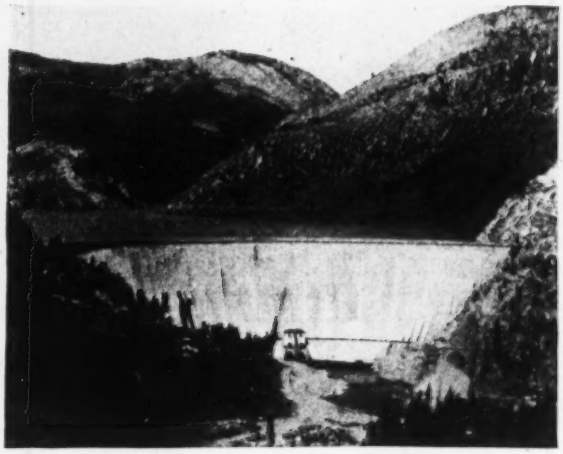


Fig. 1—The Gibson Dam, Montana
Valve house in middle. Spillway tunnel at right. Power penstocks at left.

Foundation Conditions—At the site, where the streamflow is approximately to the northeast, the rock formation is all crystalline limestone with regular beds dipping 70 to 86 deg. to the west. Several large fissures follow the bedding, and between these are a few similar cross-fissures, while a number of small bedding joints and cross-joints break the exposed bed into rather small blocks. Solid rock was excavated 5 to 30 ft. before the various seams and joints became sufficiently tight for the foundation. A warm spring flowing 20 g.p.m. from a seam under an old water channel was stopped by pressure grouting. The foundation rock was grouted through holes 5 ft. apart and 20 to 40 ft. deep under the upstream toe (Fig. 2). All holes were grouted to refusal, averaging 11 cu.ft. each, or 5 lin.ft. per sack of cement; but one hole took 440 cu.ft., and the warm spring took 406 cu.ft.

Grouting Contraction Joints—Radial joints with vertical tongued and grooved surfaces were formed in the concrete, spaced 60 and 30 ft., respectively, below and above El. 4,650, some extending to rock and others only to a depth of 75 ft. from the crest. They were closed at the upstream and downstream faces of the dam by copper strips 9 in. wide bent to form a groove 1½ in. deep. After the heat due to the setting of the concrete was entirely dissipated, these joints were grouted to permit arch action to take place under all conditions of loading.

In each joint, grouting was provided for by horizontal 1-in. header pipes connected to ½-in. riser pipes. These

headers were at the bottom of the joint and in some cases at intermediate positions also. However, experience indicated that they should have been provided at vertical intervals of 75 or 100 ft., as the additional headers would allow of grouting a joint intermittently, thus avoiding the high pressures required for grouting a high joint continuously. They would also provide for successive grouting of leaky joints. Water tests showed that the higher joints were not watertight prior to grouting.

For drainage of any water seeping into the foundation or into the construction joints of the concrete, holes 5 ft. apart were drilled in the bottom of the cutoff trench and connected to 6-in. pipes extending horizontally through the dam to its downstream toe, a little above the rock surface. To these pipes are connected vertical lines of 3-in. porous concrete pipe embedded in the concrete at 3 ft. from the upstream face (Fig. 2).

Experimental Equipment—Provision is made for measuring uplift pressure at the base and within the concrete, variations in temperatures and loads at various points, and radial deflections due to changes in concrete temperature and water load. Three shafts for experimental purposes were formed in the dam, 12 ft. from the upstream face. Horizontal vent pipes embedded in the concrete about 10 ft. above the bottom of the shafts extend to the downstream face of the dam.

For measuring uplift pressures at the base, 24 riser pipes 3 in. in diameter were arranged in six rows, four in the central part and one near each end. These pipes were set in holes drilled 18 in. into the rock and were connected by elbows to horizontal pipes, which latter were in turn connected to riser pipes leading up to the sidewalk above the downstream toe, where they were capped. Gage tests made in 1930 showed little pressure. For uplift pressures within the concrete, nine horizontal lines of four ½-in. pipes were laid extending from the shafts, those of each course having their ends at 6, 13, 20 and 30 ft. from the upstream face. These ends were surrounded with sacks of gravel, so that water percolating through the concrete could enter the pipes readily. In the experimental shafts the ends of the pipes were capped until measurements could be taken.

Resistance thermometers were placed 54 ft. and 149 ft. below the top of the parapet, where the concrete is 25.2 ft. and 54.5 ft. thick, respectively. There are eighteen at the lower end and thirteen at the higher level, placed at different distances from the face. Besides these there are 28 telemeters embedded at different locations for measuring interior stresses and temperatures. Other equipment includes strain-gage posts, clinometer brackets and deflection targets in the three shafts. A 3-ft. pit for making transit observations is provided at the top of each shaft and separated from it by a 9-in. concrete wall as a support for the transit, as shown in Fig. 2.

Stream Diversion—During the earlier part of the work a flume carried the river flow; but as the dam rose, three openings 12x16 ft. were left for this flow and were fitted with bulkheads of 24x24-in. timbers, each held open by a cable with a finger link and ring. These bulkhead gates were dropped in June, 1929, when the flow was reduced to 1,500 sec.-ft. Men on suspended chairs knocked the rings loose on two gates, which dropped through 8 ft. of water. At the third gate the ring stuck and the cable had to be cut with a torch. Leakage was considerable at first but was stopped by dumping cinders in front of the gates. Cradle cofferdams were then built at the downstream ends, and the concrete surfaces of the openings were examined, but only small cracks were found. These openings were then filled with concrete through inclined holes leading from the downstream face of the dam, and this filling was grouted.

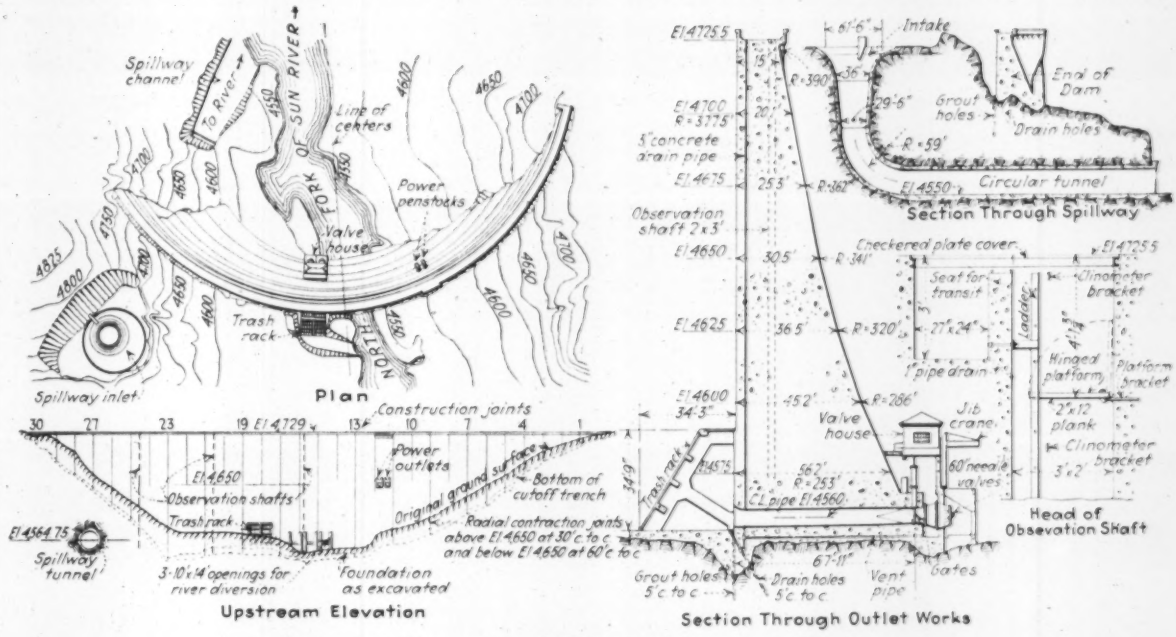


Fig. 2—Plan, sections and details of Gibson concrete-arch dam

Spillway and Outlets—To provide for overflow a 34-ft. tunnel 279 ft. long was driven from the downstream portal, and a vertical raise was driven from its end to the surface. This raise was then enlarged to full size by working from the top, both shaft and tunnel being lined with concrete to a clear diameter of 29½ ft. At the surface the shaft has a funnel-shaped intake 100 ft. in diameter at the level of the rock surface (Fig. 3), reducing to 61½ ft. at a depth of 7.3 ft., and again to 36 ft. at a depth of 28 ft., and to 29½ ft. at 80½ ft.

Water for irrigation is released through two 6-ft. steel conduits embedded in the dam. These have a reinforced-concrete frame to support trash racks at the intake.

The discharge end of each conduit has a 5-ft. balanced needle valve protected by a hydraulically operated emergency gate 5x5 ft. These gates and valves are housed in a reinforced-concrete structure. To provide for future power development there are two 6-ft. pipes through the dam, these being closed by timber bulkheads bolted to the upstream ends until such time as gates are installed.

Construction Work—Concrete was made in two 2-yd. mixers, each discharging into a hopper for delivery to 2-yd. bottom-dump cars hauled by 7-ton gasoline locomotives. These cars discharged to 4-yd. hoppers feeding 1-yd. buckets in two steel hoisting towers 280 ft. high, from which the concrete was distributed by chutes ending in vertical drop pipes. Wood forms, in 4-ft. lifts, were faced with sheet iron. The work during construction is shown in Fig. 4. Consistency of the concrete was measured by the slump test, and inundation of the sand was not required. As the moisture content of the aggregate varied widely, it was impracticable to mix with a water-cement ratio, but occasional tests showed ratios of 0.9 to 1.10, or an average of 1. The amount of water was regulated by the mixer operator, while an inspector determined the consistency by a slump test. Any concrete that was too wet was thrown away and the amount of cement charged to the contractor. Slump tests averaged $3\frac{3}{4}$ in. As measured by volume, the dry-rodded mix averaged 1 cement, 2 sand, 1.7 pea gravel, 2.2 coarse gravel and 3 of cobbles. The concrete had a density of 0.865 and a weight of 155 lb. per cubic foot.

Of 824 test cylinders the average strength was 2,940 lb. at 28 days, ranging from 1,700 to more than 4,000 lb., this latter being the capacity of the testing machine. Only 24 tests were below the specified 2,000-lb. strength. No placing was done in severe winter temperature, but in cold weather the fresh concrete was protected by canvas, the inclosure being heated by steam at the lower levels and then by oil-burning salamanders. Hot water and steamed aggregates were used. During freezing weather frequent temperature readings were taken of the concrete at the mixer and in the forms. Pipes were sometimes left in the concrete for taking temperature readings several days after the pouring. For curing, after removal of the forms, the concrete was sprinkled at least once a day for two weeks.

The contract was let to the Utah Construction Co., Ogden, Utah, in September, 1926, at $1,566,240. Excavation was begun in December, and the finishing touches on the dam and surroundings were done in the spring of 1930. Ralph Lowry was construction engineer for the U. S. Bureau of Reclamation.

Echo Dam—Earthfill Type

For the Salt Lake basin project of the U. S. Bureau of Reclamation the main feature is the Echo Dam, located on the Weber River near Echo, Utah, about 30 miles northeast of Salt Lake City.

Design of Dam—This dam, of the earthfill type, has a maximum height of 125 ft. above the riverbed, or about 151 ft. above bedrock, with a 25-ft. crest 1,804 ft. long. Its slopes are 1 on 3 to 1 on 5 for the upstream side and 1 on 2 to 1 on 6 for the downstream side, as shown in the typical sections, Fig. 5. At maximum section the base width is 830 ft., but the percolation distance is increased about 300 ft. by a dry-earth blanket at the upstream toe. To protect the face from wave action, it is covered with 4 ft. of conglomerate rock riprap to a vertical depth of 90 ft. below the crest. With the reservoir full the dam has a freeboard of 10 ft. which will be increased to 13 ft. by a parapet wall. This wall, as well as a concrete curb along the opposite side of the 25-ft. road, will be built after the dam has taken its initial settlement. The road will be surfaced with clay and sand. Drainage in the downstream toe is provided by 8- and 12-in. tile laid in trenches backfilled with gravel and cobblestones.

A reinforced-concrete core wall 12 ft. high, 18 in. thick at the bottom and 12 in. at the top, was bonded into bedrock by a footing 3 ft. wide and having a minimum depth

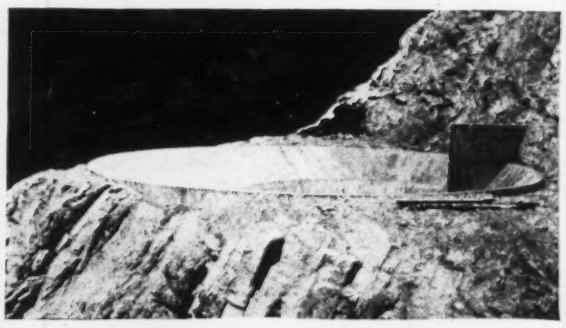


Fig. 3—Spillway intake, Gibson Dam

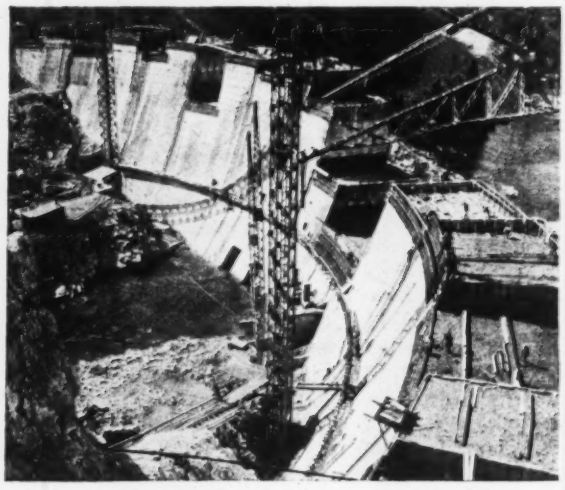


Fig. 4—Concreting the Gibson Dam

of $1\frac{1}{2}$ ft. This corewall was located where the pervious stratum of sand and gravel was thick. Its trench was backfilled with material composed largely of clay, and this was sprinkled and rolled in 8-in. layers, as in the dam. Where the pervious stratum was thin and the overlying impervious stratum of clay, sand and gravel was about 30 ft. thick or less, a trench 30 in. wide was excavated through both strata and about 18 in. into bedrock. This was filled with concrete to about 5 ft. above the pervious stratum, and the remainder was then filled with puddled clay. Where the impervious stratum on the thin bed of gravel was thicker than 30 ft., the cutoff consisted of a tunnel or stoped excavation 4 ft. wide completely filled with concrete.

Hydraulic Features—At maximum water surface, El. 5,560, the reservoir is about 5 miles long, with an area of 1,475 acres and a storage capacity of 74,000 acre-ft. With full reservoir 15,000 sec.-ft. may discharge through the spillway and 2,000 sec.-ft. through the outlet works, the total of 17,000 sec.-ft. being about three times the

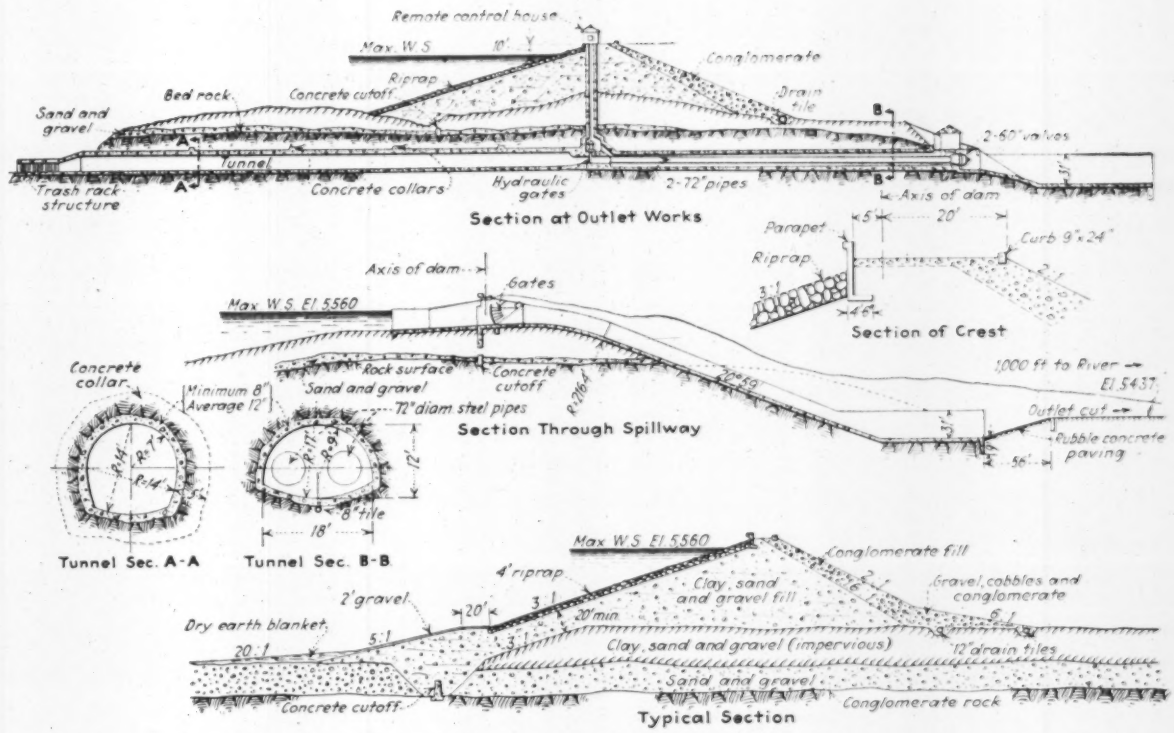


Fig. 5—Sections through the Echo earthfill dam in Utah

maximum recorded flood at this point. The drainage area above the dam is 738 square miles, with an average annual runoff of 322,400 acre-ft. The Weber River Water Users' Association has contracted to repay to the government the total cost of the dam and related works, which is estimated at about $2,240,000. Several canal companies have in turn contracted to purchase permanent water-storage rights at about $41 per acre-foot. To serve two private power plants below the dam, it will be necessary to maintain a normal river flow of 365 sec.-ft. During the period May to September, inclusive, the combined power and irrigation demands reach a maximum of 760 sec.-ft.

Another part of the Salt Lake basin project is the 9-mile Weber-Provo diversion canal, now under construction. This canal, with a capacity of 210 sec.-ft., has its head on the Weber River 25 miles above the Echo Dam, and will divert water to the Provo River. When another proposed dam is constructed on the Provo River it is planned to enlarge the canal for a maximum discharge of 1,000 sec.-ft.

Foundation and Material Tests—The base of the dam rests on an impervious stratum of clay, sand and gravel, under which is relatively pervious sand and gravel resting on bedrock known as Wasatch conglomerate at about 26 ft. below the bed of the river. Mechanical analyses of soil samples taken at the site and from the borrow-pits showed that gravel larger than 1 in. ranged from 3 to 13 per cent, and that the average grading for the remainder of the samples was 4.55 per cent fine gravel, 5.83 coarse sand, 6.58 medium sand, 20.92 fine sand, 27.57 very fine sand, 18.79 silt and 15.99 per cent clay.

To test percolation properties of these materials, a sample was packed 3 ft. deep in a 4-ft. length of 8-in. pipe, which was coated inside with tar and sand to prevent direct flow along the surface of the pipe. A depth of 12 in. of water was maintained above the sample, and, as an average, water appeared at the bottom in sixteen hours; 1¾ qt. passed in the next 24 hours, and then 3½ qt. daily for four days. The average computed velocity was 0.11 ft. in 24 hours. Shrinkage tests, made by drying long samples of soil in an oven, showed 2 per cent linear and 7 per cent volumetric shrinkage, the moisture equivalent being about 15 per cent. It was found during construction that maximum compactness of materials was obtained with 10 per cent moisture, and the endeavor was to maintain this proportion in the sprinkling operations, as described later.

Spillway and Stilling Pool—The spillway, Fig. 5, at the left end of and at right angles to the dam, is of the straight channel type and discharges into a stilling basin from which an unlined cut leads to the river. Concrete piers divide the crest into four bays, each fitted with a counterbalanced radial gate, 17 ft. high and 18 ft. wide. The gates are controlled automatically by electric hoists, the motors being governed by floats in wells located within two of the piers. Gasoline-engine operation is also provided in case of emergency.

The total length of the concrete spillway from the inlet end to the downstream edge of the pool is 587 ft. Its drop is largely on a 21-deg. slope, the channel for this gradient having a 30-ft. base and 1-on-1 side slopes. The stilling pool has a base width of 40 ft., side slopes of 1 on 1 and a depth of 31 ft., its bottom being 17 ft. below the river channel. The unlined channel beyond the pool has a base width of 30 ft., and side slopes of 1 on 1½.

Outlet Tunnel and Gates—Irrigation and power water is released through a concrete-lined tunnel 838 ft. long, driven through the conglomerate rock under the left abutment of the dam (Fig. 6). At its intake end is a concrete trash-rack structure. From the intake to the emergency gates, located below the crest of the dam, the tunnel is of horseshoe section, 14 ft. in diameter. Below the emergency gates it is segmental in section, 12 ft.

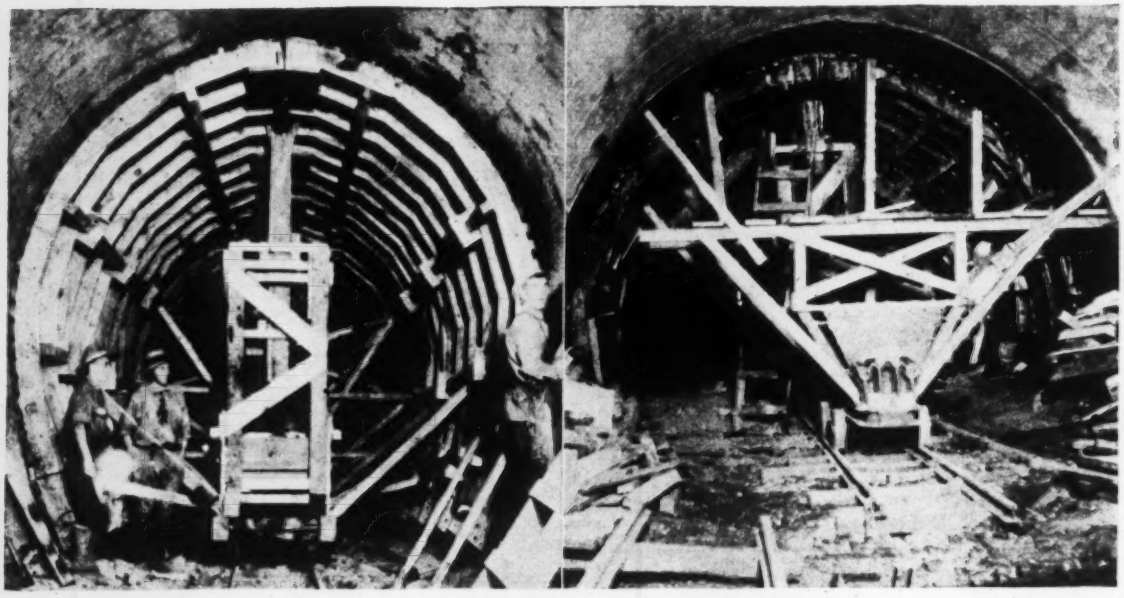


Fig. 6—Lining the outlet tunnel

At right, horseshoe section. At left, segmental section.

high and 18 ft. wide. In this latter part of the tunnel the flow is through two 72-in. riveted steel pipes and is controlled by 60-in. differential needle valves at the downstream ends, which discharge into the stilling pool. The emergency gates are hydraulically operated slide gates 5x6 ft.

For the 12-in. tunnel lining the concrete was dropped through a 6-in. pipe in the gate shaft to a hopper in the emergency gate chamber, from which it was charged to

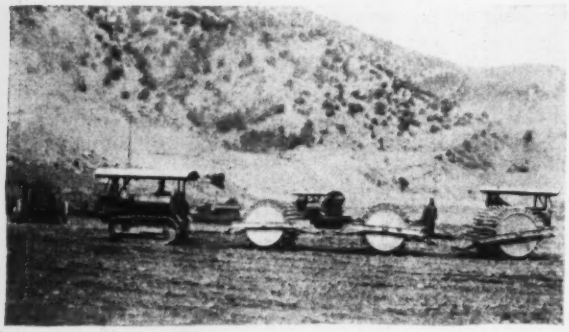


Fig. 7—Tamping rollers on the Echo Dam

a 3-yd. concrete gun and shot through a 6-in. pipe to the crown of portable steel-lined forms supported on a jumbo car, as shown in Fig. 6. The invert lining was placed after completing the sides and crown. The pressure tunnel, or that portion upstream from the emergency gates, was grouted at 40-lb. pressure, which is approximately the pressure on the tunnel with full reservoir. The grout was forced in through 2-in. holes drilled 8 ft. deep through the concrete and into the surrounding rock.

Auxiliary Works—As the Lincoln Highway and the Park City branch of the Union Pacific Railroad were about 70 ft. below the crest of the dam, it was necessary to relocate portions of these. The railroad now rises on a 2 per cent grade from Echo, passes the dam in a cut about 25 ft. below the crest and then skirts the eastern shore of the reservoir at crest level. To prevent seepage from the reservoir into the railroad cut, a puddled core was constructed in the highway fill, which is approximately parallel to the railroad and between it and the dam. About 5 miles of the Lincoln Highway was reconstructed.

Construction Methods—As material was placed in the dam it was sprinkled and rolled in 8-in. layers by tamping rollers with projecting feet, shown in Fig. 7. Care had to be taken in sprinkling, as water in excess of the 10 per cent required to secure maximum compactness made the material too wet for economical handling. Hydraulic placing had been contemplated, but mechanical analysis showed that there was insufficient coarse material to maintain the outer slopes against the pressure of a wet core. At the borrowpits material was excavated and loaded by electric, gasoline and diesel-oil shovels and hauled to the embankment by 5-yd. motor trucks, 7-yd. crawler-type motor trucks and 16-yd. dump wagons, these last being pulled by 60-hp. crawler tractors. Before dumping each load the site was sprinkled. After dumping, the piles were also sprinkled and then leveled by a tractor bulldozer. Further leveling was accomplished by a grader with a 12-ft. blade. However, leveling with a bulldozer was not required with the 16-yd. dump wagons, as these distributed the material in dumping.

The conglomerate rockfill in the river channel was sprinkled and rolled in 12-in. layers. Stones larger than 12-in. size were picked out and piled along the downstream toe. Sand from the riverbed was suitable for concrete, although it required washing. The gravel was of good quality, and after removal of a rather large percentage of $\frac{1}{4}$- to $\frac{5}{8}$-in. pea gravel it was fairly well graded.

The contract for the Echo Dam was awarded in November, 1927, to A. Guthrie & Company, Inc., Portland, Ore., at $1,125,098, the government furnishing cement, reinforcing bars, gates and other equipment and materials. The dam is now practically completed except for the parapet wall and roadway curbing. Reconstruction of the highway and railroad was let to the Utah Construction Co., Ogden, Utah, at $386,970, and was completed about April, 1929. F. F. Smith was construction engineer on the project for the U. S. Bureau of Reclamation.

Vehicle Tunnel to Be Built Under the Scheldt at Antwerp

Tunnel design and construction to follow American practice—Small auxiliary tunnel to be built for convenience of pedestrians and cyclists

PLANS for the development of the west bank of the Scheldt River at Antwerp, under consideration by the city authorities and the government of Belgium for many years, culminated in 1929 in the formation of a commission authorized to construct a vehicle tunnel under the river to give convenient access to the west bank from the center of the city. Practically all of the industrial developments and shipping facilities of Antwerp are concentrated on the east bank of the river. With the increase in commerce passing through the port in recent years, development of the west bank, largely used as farm lands because of its inaccessibility, became highly desirable. Bridging the river was considered but was abandoned on account of the density of river traffic, and construction of a vehicle tunnel was determined upon as the only alternative.

During the spring of 1930 the commission, known as the Société Intercommunale de la Rive Gauche de l'Escaut, advertised for proposals of plans, specifications and cost bid for the construction of a vehicle tunnel complete and ready for operation. The invitation was accompanied by an outline plan and specifications, but no restrictions were made with respect to the type of design or method of construction. The invitation also provided that the competitors prepare such plans and specifications of their own design as might be considered an improvement upon the location and general outline plan prepared by the commission.

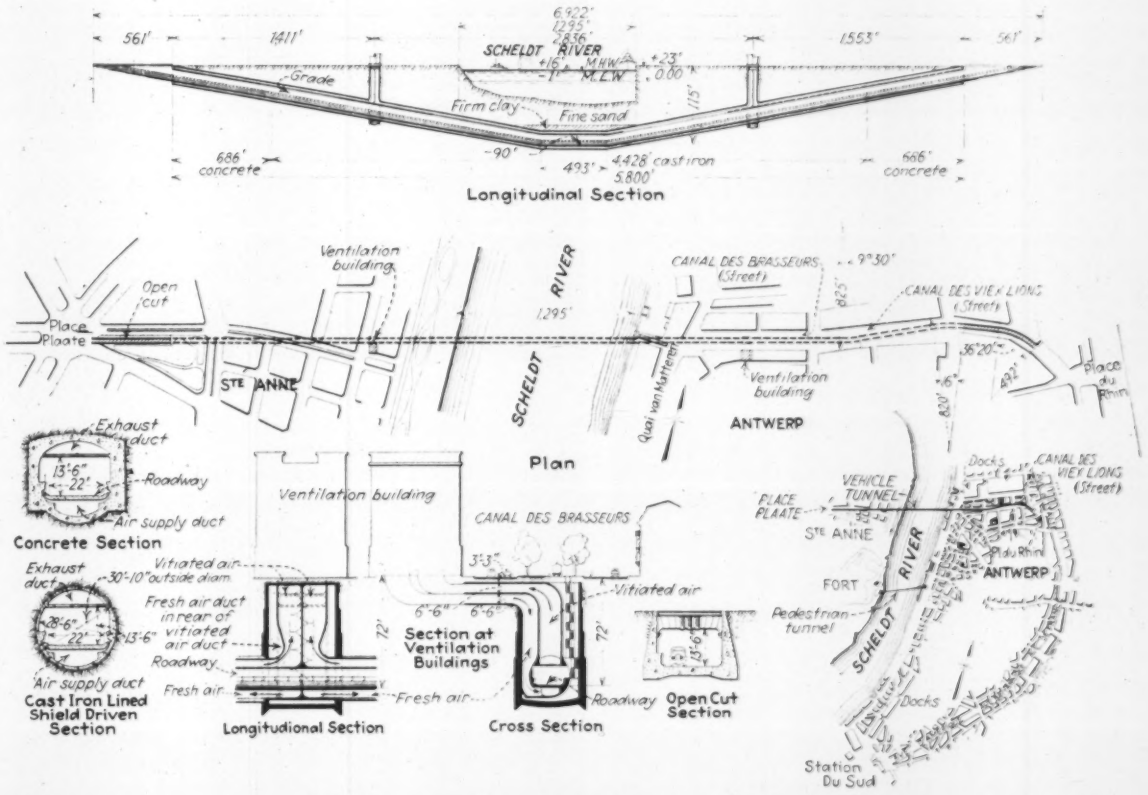
The commission's outline plans and specifications called for the detailed design and construction of a vehicle tunnel with walkways for pedestrians, the grades of the approaches to be 3 per cent and elevators to be provided on either side of the Scheldt River immediately adjacent to the banks for automobiles and pedestrians. The competing firms were to submit bids upon at least two different plans prepared by the commission:

1. A ramp tunnel with elevators for pedestrians.
2. A ramp tunnel with elevators for pedestrians and auxiliary elevators for vehicles.

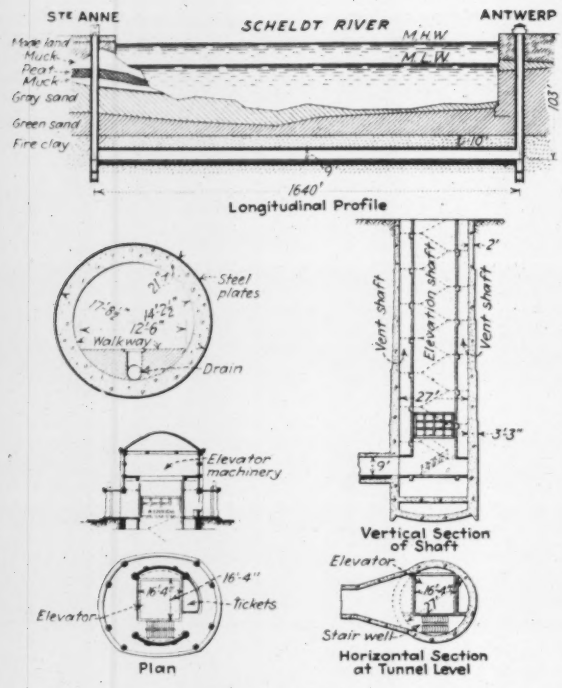
The competing firms were also authorized to submit, in addition to tunnels of their own design, tunnels located at other points and having different alignments from those shown in the commission plans.

By the time bids were opened on Sept. 15, 1930, more than 60 different projects for crossing the river were submitted to the commission by eleven contracting firms of international reputation. After four months of deliberation the award was made to the firm of Pieux Franki, of Paris, and Liége, Belgium, according to plans and specifications and bid prepared by that firm, with the assistance of engineers of the firm of Parsons, Klapp, Brinckerhoff & Douglas, New York, and Ole Singstad, former chief engineer of the Holland Tunnel at New York.

The tunnel plans upon which the award was made vary somewhat in character and location from those outlined by the commission. The tunnel, as shown in the accompanying drawings, is similar in dimension and in interior arrangement to the Holland, Posey and Detroit tunnels and is without sidewalks, as called for in the commission's original plans, pedestrians being taken care



Principal details of the vehicle tunnel to be built at Antwerp



Proposed pedestrian tunnel at Antwerp

of by a small tunnel about half a mile upstream from the vehicle tunnel. The pedestrian tunnel is to be built without inclined approaches, ingress and egress being by means of elevators placed on both banks of the river. Because of the wide use of bicycles in Belgium the elevators are to be sufficiently large to accommodate them conveniently.

Studies made by the consulting engineers to the firm of Pieux Franki indicated that it would be more economical to build a small tunnel near the center of the city for pedestrians crossing the river than to drive as large a tunnel as would be required to provide for both vehicles and pedestrians in one tube. Further, the foot tunnel could be located close to the center of the city, thus making it possible to locate the vehicle tunnel at the most suitable place without regard to the movement of pedestrians to and from the portals.

Vehicle Tunnel—The vehicle tunnel is to be of the shield-driven type with cast-iron lining similar in design to the Holland Tunnel. The Scheldt River at the point of crossing is about 1,300 ft. wide and has a tidal range of 15 ft. With a specified navigable depth at mean low water of 45 ft. and with allowance for ample cover, the maximum depth of the roadway below mean water will be about 90 ft. With approach grades of 3½ per cent the total length of the tunnel between portals will be 5,800 ft. and the length between street grades will be 6,922 ft. The roadway is to be 22 ft. wide to accommodate two lanes of traffic in opposite directions. This will give an estimated traffic capacity of 1,000 vehicles per lane per hour.

One narrow sidewalk is provided for control purposes along one side of the tunnel, and provision is made on the opposite side for water, gas and electricity.

The materials through which the tunnel is to be driven is a fine saturated sand containing a small amount of clay. A firm clay stratum is found at a depth of about 80 ft. below street grade. The major part of the tunnel directly under the river will, therefore, be driven through clay. The tunnel will pass under a massive dock wall at the right bank of the river and under levees on the left bank.

Ventilation—The ventilation of the vehicle tunnel will follow the system used for similar tunnels in this country. There will be two ventilating buildings, one located about midway between the portal and the river bank on each side of the river.

Pedestrian Tunnel—The small tunnel for pedestrians is to be driven without the use of a shield. The structure will be circular in section with a concrete lining inside of pressed-steel liner plates. It will have a length of about 1,640 ft. and an outside diameter of 17 ft. 8 in. The footwalk will be 12 ft. wide.

In the preparation of the plans and proposal for the Belgian firm of Pieux Franki, the firm of Parsons, Klapp, Brinckerhoff & Douglas was represented by Walter J. Douglas, Soren A. Thoresen and Vincent Maculuso. As noted previously, Ole Singstad, chief consulting engineer on tunnels to the Port of New York Authority, also took part in the preparation of the plans and specifications.

Tieing a New Addition to a Leaning Building

By W. C. SPIKER
Consulting Engineer, Atlanta, Ga.

SEVERAL unusual structural and foundation problems were solved in constructing a new addition, varying in height from seven to seventeen stories, to the existing seventeen-story First National Bank Building in Atlanta, Ga. The principal difficulty lay in the fact that the original building, being on spread footings and therefore subject to settlement, had leaned out of plumb (away from the new addition) about 5 in. at the top. The problem, therefore, was to connect the old and new building so that there would be no noticeable line of demarcation between them; and this was particularly important because there were to be practically no partitions in the first seven stories of the combined structure, which was the portion to be used by the bank. A sketch plan of the old and new buildings is shown in Fig. 1. The total cost of the work, including the new building and a new floor system in the first three stories of the old building, was approximately $2,000,000.

Foundation Conditions—The geological formation at the site is a mica schist carrying considerable clay and having physical properties similar to those of clay. Since the old building rested on spread footings, this type of foundation was first considered for the new addition. However, since new spread footings would have to be excavated below the old foundation, there was danger that the construction operations would dewater the earth under the old building and cause further settlement. After making extensive soundings and borings it was decided to put in concrete cylinders to rock. This type of foundation was successfully constructed, but in dewatering the holes for the cylinders the near edge of the old building settled about ¾ in., in accordance with the theory that had been expressed concerning the construction of spread footings. This settlement apparently did

no harm to the old building; on the other hand, it tipped it back about 2 in. at the top so that structural plans for the new building had to take account of only a 3-in. separation at the top instead of 5 in., as originally contemplated.

Compound Columns—With the foundation problem solved, the next most important feature of the design consisted in reinforcing the wall columns of the old building adjacent to the new building. Double columns were not practicable, as it was desired that the finished columns along this line should not be out of proportion in over-all size with the adjacent columns in the old and new buildings.

In studying methods for reinforcing the old columns, consideration was given to removing all load from them, carrying the loads of the first bay in the old building and the first bay in the new building on cantilever girders, but this method was abandoned as troublesome and expensive. The method adopted was to add to the old columns sufficient steel to carry the first bay in the new building and to connect this steel to the old columns with a slip joint, so that none of the load in the new building would be thrown into the old building columns. Details of these connections are shown in Fig. 2. After all of the dead load of the new building was in place, so that most of the shortening in the new column steel had occurred, the combined old column and new section were concreted in. In the final analysis, therefore, the two columns will act somewhat as a unit.

A possible objection to this design is that if the spread footings of the old building continue to settle, extra load will be thrown into the new column sections, which cannot settle, since their foundations are on rock. The possibility of settlement of the old building, however, was not considered as serious, in view of the fact that settlement resulting from dewatering the new foundation had been only about $\frac{3}{4}$ in. more than that which had occurred in the 25 years during which the old building had been standing. As a matter of precaution an extra-conservative design was used for the foundation cantilevers on which the new column sections rest and for the column sections themselves.

Bolted Connections—A feature of the new addition was the fact that all field connections were made with turned bolts, a condition resulting from an effort to reduce erection noises to a minimum. Designs permitting either welded or turn-bolted connections in the field were put out for bids, with the provision that riveting

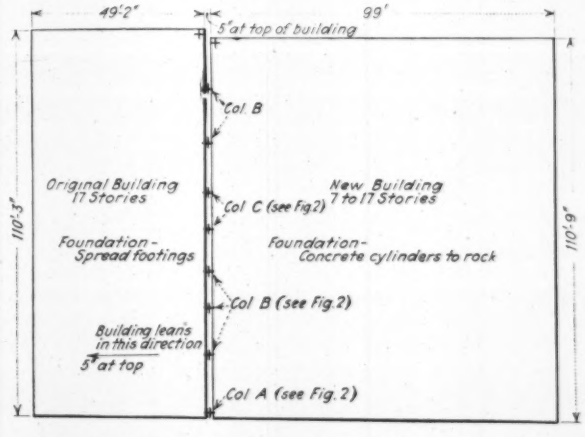


Fig. 1—Connection of a new addition to the First National Bank Building in Atlanta, Ga., aggravated by lean of old building due to settlement

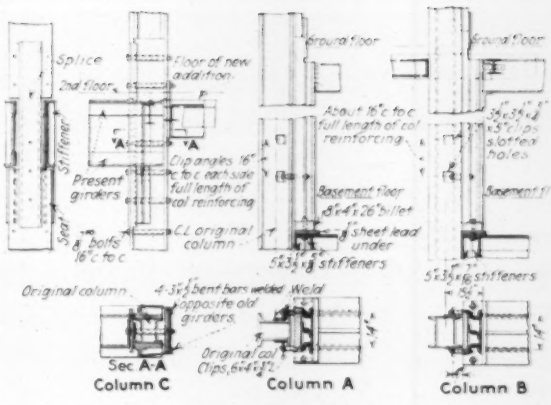


Fig. 2—Slip-joint details of reinforced-steel column

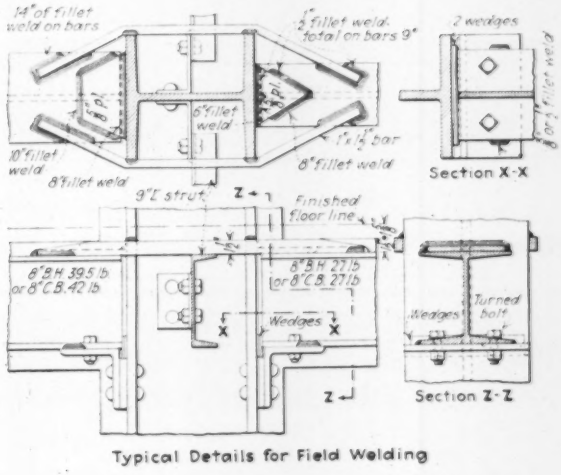


Fig. 3—Suggested design for continuous welded girders

could be resorted to if these alternates proved too expensive. Low bids were roughly $90,000 for the bolted job, $92,000 for the welded job and $93,000 for the riveted job.

Although the welded construction was not adopted, a new girder-column connection detail was designed to develop continuity in the girders. The detail is shown in Fig. 3.

The firm of Pringle & Smith, of Atlanta, was the architect for the building, and W. C. Spiker & Co. were the structural engineers. Carlton S. Proctor, of Moran & Proctor, consulting foundation engineers of New York, advised on foundation procedure. The Barge-Thompson Co., Atlanta, was the general contractor. Steel was fabricated and erected by the Ingalls Iron Works Co., Birmingham, Ala. Concrete cylinders for the foundation were put in by the Gow Co.

Correction

In the article entitled "Sludge-Bed Material Spread by Machines," in the issue of May 14, a typographical error occurred in the name of the author. It should have read "Norval E. Anderson." Also on p. 801, in the first column, tenth line, the dimensions should have been 81 ft. 6 in. instead of 8 ft. 6 in.

Two New Airports at Detroit

City and county opened fields in 1930—L-shaped field in city—Hangar roofs designed for clear floor space—Telescopic doors

TWO important airports completed in 1930 at Detroit, Mich., by the city and Wayne County respectively, make a total of 31 airports that have been established within a radius of 30 miles from the center of the city. However, twelve of these are now abandoned or disused, while some of the others have limited facilities. But at the end of 1930 there were about twenty airports in regular operation within that area. Special features of the two new airports are the L-shaped site of the municipal port and the arrangement of several relatively small hangars for the county port.

Detroit Municipal Airport

This city-owned port, opened in April, 1930, is at Connors and Gratiot Aves., only 5 miles northeast of the city hall. It is peculiar in having an L-shaped field (Fig. 1) with an area of 270 acres, with four 100-ft. paved runways 1,000 to 5,000 ft. long, aggregating 2½ miles and giving takeoffs in six directions. Paving on these runways includes 7-in. concrete, 7-in. asphaltic concrete and sheet asphalt on waterbound macadam. Between the runways is a firm turf surface. A drainage system, installed in gridiron fashion under the entire field, is connected to the city sewers. It comprises 5 miles of 12- to 18-in. lateral sewers and 17 miles of 4- and 6-in. drain tile laid in stone-filled trenches. In the angle between the runways is a gas holder 218 ft. in diameter and 330 ft. high. As this will not be removed for some time, it has been painted in horizontal bands of black and yellow and outlined with lamps so as to be conspicuous as an obstruction and also as a landmark.

The main municipal hanger, 1,014 ft. long, is 250 ft. wide for 114 ft. at one end, 204 ft. wide for 786 ft. and 127½ ft. for the 114-ft. north bay. As it is located on filled ground with a maximum depth of 40 ft., pile foundations were required, and concrete piling was adopted on account of the low groundwater level. This building, with capacity for nearly 200 airplanes, has two main doorways 150 ft. wide and 25 and 30 ft. high, with motor-operated sliding doors. Besides these there are ten doorways 100x20 ft. and two 80x20 ft.; all these have sliding telescopic doors. Steam-heating units with fans at the floor level maintain an interior temperature of 55 to 60 deg. F. The city has also a service hangar 95x100 ft., with adjacent repair shop, and there are two private hangars 100x120 ft. and 80x160 ft.

The structural steel framing for the hangar was designed originally for a hangar of different type and was purchased when partly fabricated. In this previous design the roof trusses were to be side by side for a single-span structure, having a wall on one side and doorways on the other side. By placing the trusses in pairs end to end, as shown by Fig. 2, a wide structure was obtained having doors on both sides and a single row of columns in the middle. These center columns are spaced 51 ft. c. to c. longitudinally, except at one end, where there is a span of 150 ft. They carry trusses supporting the ends of the transverse roof trusses, which are spaced 25½ ft. c. to c. and have their outer ends seated on trusses of 80-, 100- and 150-ft. span over the doorways. About 60 per cent of the exterior surface consists of door and window areas. The roof is covered with asbestos felt over ½-in. insulation laid on precast concrete tile.

The doors are in sections about 9 ft. 3 in. long for the 150-ft. opening and 10 ft. for the smaller openings, these sections being offset 7 in. c. to c. so as to telescope together, as shown in Fig. 3. When the door is closed

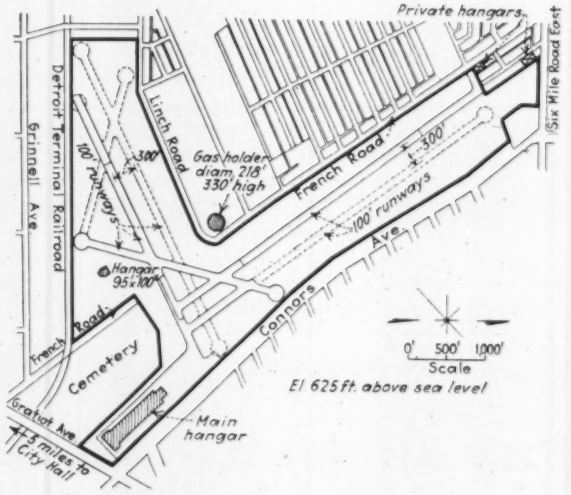


Fig. 1—Plot of L-shaped Detroit airport

Large gas holder in the angle is both an obstruction and a marker.

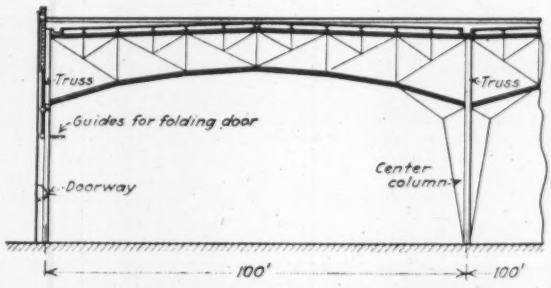


Fig. 2—Hangar of Detroit city airport

Roof trusses are carried by center trusses on columns and side trusses spanning the doorways.

the sections lap 1⅛ in. Rectangular steel tubing for the door framing carries plating in the lower part and steel sash in the upper part. Each section has 8-in. grooved rollers riding on 16-lb. steel rails embedded in the concrete floor, the heads of these rails being planed flat. At the top of the door sections are 6½-in. horizontal rollers riding between guide angles attached to the roof framing. Clearance spaces at top and bottom and between the sections are closed by rubber baffle strips bolted to the doors in order to exclude wind and dust. In the large 150-ft. doors each section has a 5-hp. motor geared to one of the bottom rollers.

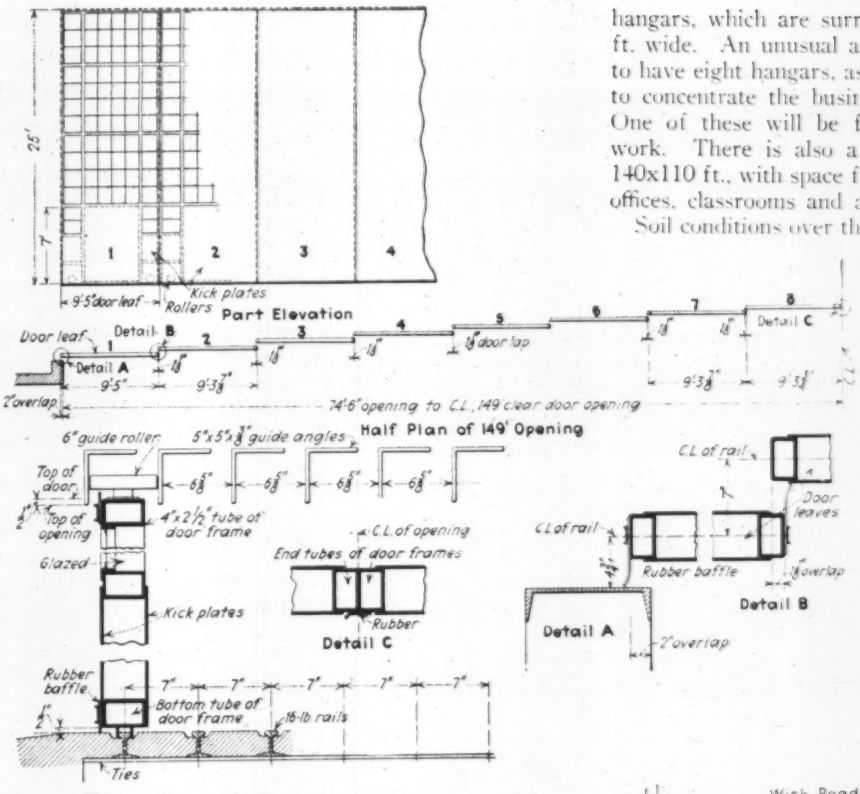


Fig. 3—Telescopic doors for hangars

This municipal airport was designed under the direction of Perry A. Fellows, city engineer; M. F. Wagnitz, engineer of public structures, was in charge of the design of the hangars. W. J. Wallace, engineer of paving design, is now manager of the airport. Its cost, including land, buildings, paving, lighting and heating equipment complete, was about $2,400,000, which was provided by a bond issue.

Wayne County Airport

Among the several airports built in and around Detroit, as already noted, the latest is that established by the Wayne County road commission. This port, opened in September, 1930, is situated about 16 miles southwest from the Detroit city hall. Its site is 1 mile square, or 640 acres, with runways laid out in the direction of the prevailing winds. The general layout and the completed works are shown in Fig. 4.

The 100-ft. runways are of 8-in. reinforced concrete flanked on each side by a 3-ft. strip of crushed stone. Taxi strips 36 ft. wide lead from the runways to the hangars, which are surrounded by concrete aprons 125 ft. wide. An unusual arrangement is that it is planned to have eight hangars, as shown on the plan, rather than to concentrate the business in a single large structure. One of these will be for a machine shop and repair work. There is also a military hangar, already built, 140x110 ft., with space for about fourteen planes, besides offices, classrooms and a machine shop.

Soil conditions over the greater part of the field, which is very nearly level but with a slight fall to the east, consist of 6 to 10 in. of loam over a deep bed of heavy clay having some sand streaks and pockets. To provide efficient drainage there is nearly 200 miles of 4-in. vitrified tile laid in trenches 28 to 42 in. deep and covered with 6 in. of pea gravel, over which is loam. These drains connect with about 17 miles of 8- to 30-in. vitrified pipe sewers discharging into three reservoirs at the low side of the field. Each reservoir is served by two 10-in. centrifugal pumps with 25-hp.

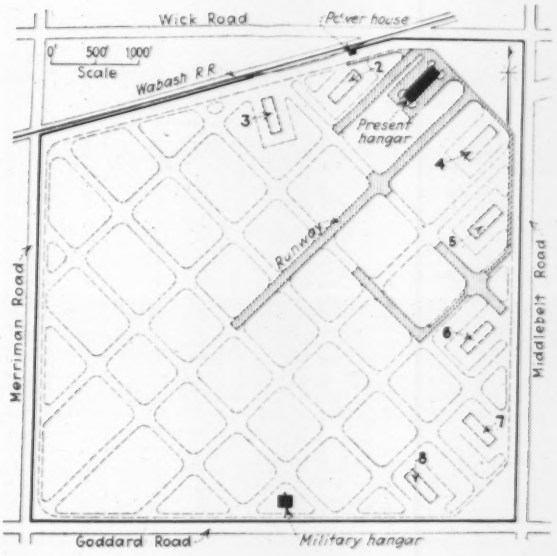


Fig. 4—Wayne County airport
Site is 1 mile square. Note layout for several hangars.

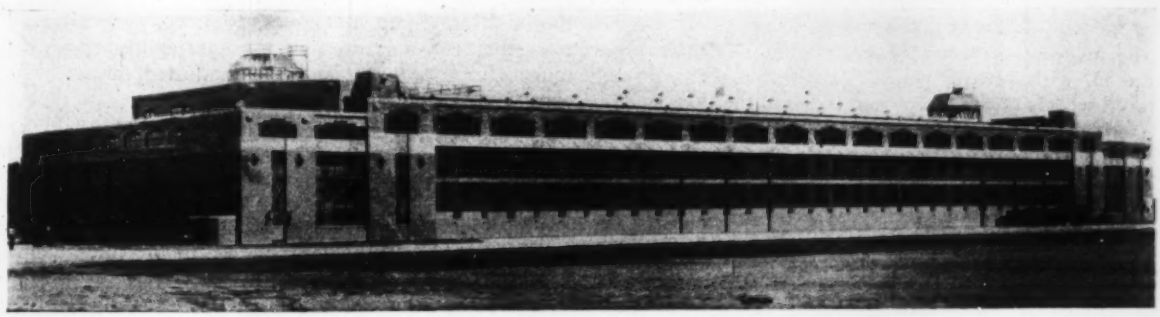


Fig. 5—Hangar at Wayne County airport

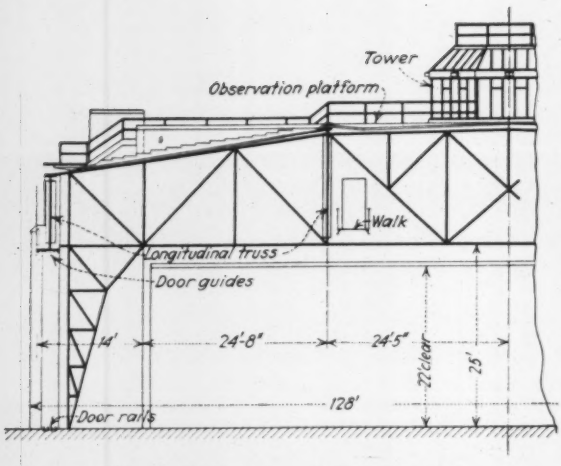


Fig. 6—Typical cross-section of hangar

Three transverse trusses carry four lines of longitudinal trusses supporting intermediate roof trusses.

motors, housed in a concrete building and delivering the water into a county drainage ditch. Manholes on the sewers are 18 in. below the surface, so as not to be struck by airplane wheels, but they are marked by a covering of broken stone. Spaces between the runways are seeded for a heavy turf surface.

The first of the hangars, Figs. 5 and 6, is a steel and brick structure 434x128 ft., with a one-story section 314 ft. long and a 60-ft. three-story section at each end. The main floor, which extends over the entire area, has two 157-ft. openings on each side and a 90-ft. opening in each end, all of these having a clear height of 24 ft. One end section has offices and rooms on the second floor for the public, above which is an octagonal glazed tower for observation and light control, with a tiled terrace for use of the public. At the opposite end the second floor provides accommodation for the pilots and operating staff, while a similar glazed tower is assigned to the U. S. Weather Bureau. Stairways and automatic electric elevators serve the upper floors, while walkways suspended from the roof framing connect the second floors of the two end sections. Heating is by steam piped from the power house to radiators and blower units. Buff brick and stone are used for the walls, and the roof is of lightweight cement tile.

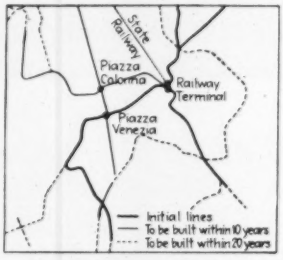
An entirely unobstructed floor area 314x128 ft. is provided by supporting the steel roof framing on four corner columns and an intermediate column in each side. These six columns carry three transverse trusses, Fig. 6, to support the ends of four lines of 158-ft. longitudinal trusses, which in turn carry transverse roof trusses spaced 22 ft. c. to c. Along the middle transverse truss is an inclined walkway giving access to the roof. Doors of the airplane floor are of the sliding telescopic type (Fig. 3), with vertical panels 10 ft. wide that ride on grooved wheels on steel rails embedded in the floor, while the tops have horizontal guide wheels riding between lines of guide angles.

The airport was designed and constructed under the direction of Leroy C. Smith, engineer and manager for the Wayne County road commissioners. The hangar was designed by Giffels & Vallet, Inc., engineers, Detroit, Mich. The total cost, including land, construction work, buildings and lighting equipment, is about $2,600,000 and is covered partly by a bond issue of $2,000,000.

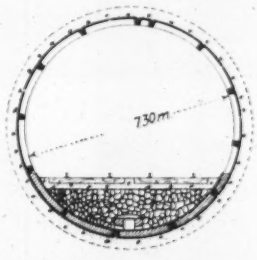
The Subway of Rome, Italy

CITY transit in Rome, long served by a street-car system throughout the city, was changed on Jan. 1, 1930, by removing the cars from the central station and operating buses instead, the street cars continuing to serve the outer districts and operating in a ring around the center. This change speeded up rush-hour movement from 3 m.p.h. or less to 10 to 12 m.p.h. in the congested district. However, congestion continues to increase, especially as archeological and historical considerations limit the freedom of surface transit. Establishment of a subway system is therefore planned.

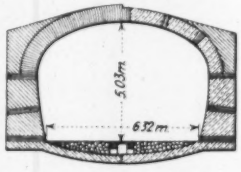
Roman soil is particularly unfavorable to subway construction, being rich in underground waters and of heterogeneous structure. During the days of the ancient Romans the ground underneath the city was pierced in



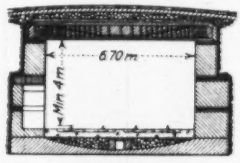
Rome's proposed subway



Tube section



Normal tunnel



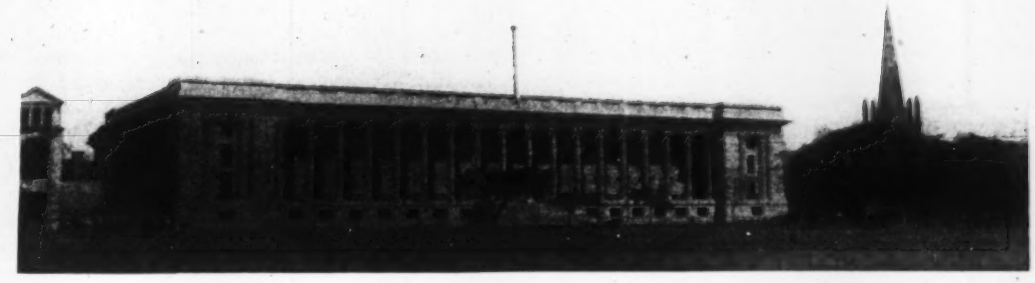
Section with flat roof

many places by excavations in the search for building materials, these openings remaining as the so-called catacombs. During the last few years more than 500 borings have been made in the subsoil.

The proposed subway lines have been laid out to take care of the densest traffic first, with gradual additions to the system until it is capable of caring for an estimated population of 2,000,000 about 1950. The present population of Rome is about 1,000,000. The first part of the system to be constructed will be 15.3 miles long, and the completed system will be 35 miles.

The nature of the soil and the location of buildings limit the depth at which the subway can be constructed and prescribe that it shall as a rule remain close to the street surface, as in New York. But the streets in the central part of Rome are narrow and tortuous thoroughfares, and, moreover, Rome is very hilly. In consequence, the gradient of the lines will reach a maximum of 3.8 per cent and the minimum radius of the curves will be 240 ft. at some points. According to the condition of the soil, the subway structure will be vaulted tunnel, tube or flat roof. In the central part of the city the tube will largely predominate, on account of the soil structure and underground water.

Financing of construction will be borne by the Italian government, which will retain title to the lines. Operation, however, will be assigned to a private company. The cost of constructing the first portion of the line track included, is estimated at about $22,000,000.



Town hall of Singapore

Municipal Engineering in Singapore

By HAROLD E. BABBITT
Professor of Sanitary Engineering, University of Illinois, Urbana, Ill.

ENGINEERING activities of the municipal government of Singapore, owing to the recent rapid growth of the city, are extensive. The expenditures of some of the municipal departments are given in Table I, and Table II gives in detail the expenditures of the municipal engineering department.

Roads and Streets—Practically all of the 140 miles of streets in the city are paved, the principal paving materials used being asphalt and concrete. Of the 3,000,000 sq.yd. of paved streets, 1.8 per cent are of concrete, 2.4 per cent of macadam, 24.5 per cent of sheet asphalt or apshaltic concrete on a concrete or macadam base, 29.1 per cent of asphalt-filled macadam, and the remaining yardage a combination of the above-named materials. Wood has been found unsatisfactory because of the activities of white ants, and brick, although manufactured locally, are too expensive and of too poor quality to make good pavement. When concrete is used, the general practice is to allow the concrete pavement to wear for a few years, and then to cover it with an asphalt wearing surface. On important streets the asphalt wearing surface is used from the beginning. The pavements are in excellent condition and withstand the high temperatures, concentrated loads and heavy traffic without rubbing or waving. Wide use of trackless trolleys is insufficient to cause uneven wear. Up to March, 1930, the asphalt was laid according to specifications of the American Society for Testing Materials, a penetration of 30-40 for sheet asphalt, 40-50 for asphaltic concrete and 80-90 for painted macadam being used. After that date the practice of asphalt laying was changed to British specifications.

Asphalt is mixed at a central mixing plant on the waterfront, and the mixture is conveyed to the job in trucks. Asphalt wearing surfaces are laid on concrete or other prepared foundations. Concrete pavements and concrete foundations designed for an asphalt wearing surface are laid upon a 1-in. sand cushion resting on the prepared sub-base. Concrete is laid in thicknesses from 6 to 9 in., depending on the condition of the subgrade and the traffic to be carried. It is customary to make the pavement the same thickness from center to edge and to use reinforcement only under the heaviest traffic. The steel reinforcement used is 4 to 5 lb. per square yard of concrete, with a maximum of 10 lb. Until recently the reinforcement was placed near the bottom of the slab, but present practice places it near the top, as less cracking has occurred in slabs so reinforced. Both plain and reinforced slabs are provided with expansion joints every 50 ft.

Bridges—The Singapore River, the Rochore Canal and certain open drainage channels are the principal waterways over which bridges must be constructed. Nine of these bridges have a length greater than 75 ft. and there are many smaller ones. The Anderson Bridge, at the mouth of the Singapore River, has a clear span of 192 ft. All the bridges are fixed and many different types are used. Recent tendencies lean toward the use of a bowspring arch of reinforced concrete with suspended roadway from which the sidewalks are cantilevered. The Elgin Bridge, completed in 1930, is of this type, with a clear span of 140 ft., two 26-ft. roadways and two 5-ft. sidewalks. The Cavanaugh Bridge, built in 1868, is the oldest long-span bridge in use. It is a link-bar suspension bridge with heavy stiffening girders and a span about equal to that of the Anderson bridge.

Foundation conditions are particularly difficult for bridge construction, as the ground is a liquid clay and firm material lies at depths greater than 60 to 80 ft. In the construction of the Grove Road Bridge, which was completed in 1929, no suitable material could be found for a foundation at depths of 100 ft. or more. The bridge was therefore supported on a concrete raft 80x100 ft. in plan and 3 ft. 6 in. thick laid in the muck of a mangrove swamp. This bridge, of the beam-and-slab type, has two 40-ft. spans with a 40-ft. roadway and two 10-ft. side-

TABLE I—SOME MUNICIPAL DEPARTMENTAL EXPENDITURES IN SINGAPORE IN 1928

Municipal engineer	$2,071,133	Town cleansing	$419,078
Architect	1,462,806	Water	4,017,390
Building inspector	73,982	Electricity	1,158,278
Sewerage	216,051	Gas	556,067
Total			$9,974,785

The figures are in U. S. dollars on the basis of one U. S. dollar equals 1.75 Straits dollars.

TABLE II—MUNICIPAL ENGINEER'S DEPARTMENT EXPENDITURE FOR 1928

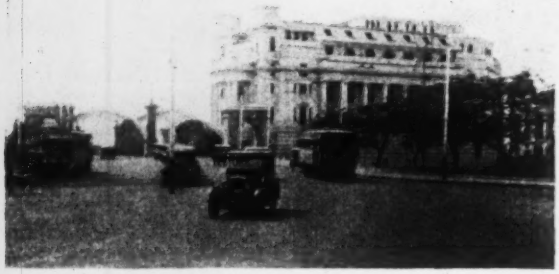
Personal emoluments and other charges	$89,245	Incinerators	$32,364
Roads, streets and bridges	1,452,969	Drainage	104,255
Piers and canals	21,762	Disbursements recoverable	221,532
Public grounds	30,250	Store	47,329
		Workshop	71,427
Total			$2,071,133

walks. Its unique feature is that the entire structure—raft, columns, beams and slabs—is a monolith.

No new bridges are contemplated in the near future, but traffic conditions on the Singapore River demand raising of all bridges, which will be done as funds are available. The largest work will involve raising the railroad bridges, which will be attempted in about four years.

Drainage—The drainage work under the municipal engineer consists in designing and constructing needed storm drains, which are separate from the sanitary sewer system. In this respect much work has to be done, because the high tides, unsatisfactory outlet conditions, short, violent rainfall and inadequate drain capacity result in much flooding. The practice is to construct open drains beside the roadway, leading to large, open drainage channels. Precast concrete slabs built in the municipal factory form the bottom and sides of these open drains. Approximately 150,000 ft. of pipe, slabs and culverts are made at the plant during a calendar year. Last year this was insufficient to supply the demands of the 25 miles of drains laid and additional pieces were purchased from a private manufacturer.

Stores, Workshop and Transport Center—The stores section of the municipal engineer's department receives and issues materials required by the department and also



Traffic on asphalt-surfaced street

The Anderson Bridge and the post office are in the background.

serves other departments to a limited extent. Because of the broad scope of the activities of the municipal engineer's department, materials handled are of a diverse nature and are large in quantity. Cement represents one of the principal items handled.

The municipal shop includes a foundry, a machine shop, a boiler shop, a blacksmith shop, woodworking shops and a materials-testing laboratory. These facilities are used by all of the municipal departments and for some commercial purposes. During 1929-30, for example, the foundry turned out 300 tons of iron castings at 3.44c. per pound, 2 tons of brass at 23.24c. per pound and a total of 1,500 lb. of copper, aluminum, lead and white metal.

The transport center is supervised by the municipal engineer for the use of all the municipal departments, which must hire their transport through the center, when transport is available. The rate charged is slightly higher than the market rate to permit the purchase of needed equipment, as the present facilities are inadequate for all needs.

Incinerator—The operation and maintenance of the incinerator are assigned to the municipal engineer's department, but the collection of refuse is done by the town cleansing department. The existing incinerator is worn out and is about to be replaced. Both the old and the new incinerators are of the Horsfall (British) type, the new one having overhead type feed. The old incinerator has a capacity of 600 tons in sixteen hours, divided among three units of four cells each. Although worn out, its capacity has not yet been reached, as only about 29,000 tons of material were incinerated, in addition to waste market products and dead animals, during the year 1929-30. The new incinerator will have four units of four cells each, capable of handling 800 tons of refuse in sixteen hours.

At present the two-can system of collection is used, all non-combustible material, except tin cans, going to the dump for land fill. Because the moisture content of the material to be incinerated is high, additional fuel is required and excess heat is not utilized. Oil will be used in the new unit, and the use of gas from sewage sludge digestion is contemplated.

Garbage is collected twice daily throughout the congested parts of the city and once daily in the more remote districts. The cleanliness of the city is attested by the absence of flies and odors, except odors coming from tidal floods and clogged drains at the waterfront. The frequency of garbage collection results in the delivery of large quantities of wet material to the incinerator. This garbage is put into a watertight receptacle by the householder, who places it at a convenient place on his premises for the collector. Where back alleys exist, the garbage receptacle is fastened in the fence so that it can be easily dumped by the collector into a can carried by him for the purpose.

Municipal Architect—The municipal architect is charged with the design and supervision of construction of all buildings for municipal purposes. These buildings include government offices, army barracks, power houses, apartments, bungalows, residences, tenements, godowns, abattoirs, hospitals and crematories. The construction of dwellings for all classes of municipal employees, from department heads down to the lowest coolie, is a policy of the government which adds much to the desirability of municipal employment. General use of reinforced

The Anderson Bridge over the Singapore River

concrete, attractive architecture, use of colored tile roofs on white or lead-colored buildings with some darker trim, attractive landscape effects and fine residences for the higher officials are important factors in advancing the city's fame for beauty.

Competing with the government post office for the honor of being the most beautiful building in the city is the town hall, completed in 1929 at a cost of $1,200,000.

The municipal architect is not only responsible for the design and construction of municipal buildings but he acts in an advisory capacity on the appearance of all municipal structures such as bridges and dams. No consulting architect is employed.

Town Cleansing Department—The town cleansing department is charged with collection of refuse and night soil, sweeping and watering the streets, maintenance of

TABLE III—IMPOUNDING RESERVOIRS IN SINGAPORE WATER SUPPLY

Name	Capacity, Million Gal.	Area of Watershed, Acres	Year Complete	Location
Thompson Road or Mac Ritchie	1,260	1,890	1868 1894 1905	Singapore Island
Kalang River or Peirce	1,187	3,007	1910	Singapore Island
Selatar	312	2,100	.....	Singapore Island
Sultan Ibrahim	1,525	1,980	1929	Johore
Pontian Kechil	3,750	3,000	Under Construction	Johore

TABLE IV—WATER CONSUMPTION IN SINGAPORE

Year	Water Population	Consumption, Gal. Per Capita Per Day	Average Pumpage, Gal. Per Day	Maximum Day's Consumption, Gal	Per Cent Filtered	Per Cent Metered
1928	450,000	42.1	18,936,000	21,481,000	100	78
1923	350,000	38.6	13,500,000	15,776,000	31	69
1918	270,000	37.6	10,151,000	13,010,000	72	57

pumping grounds and public comfort stations, cleanliness of municipal markets, licensing of hawkers, housing of coolies, extermination of rats and such other duties as may aid in the maintenance of a clean city. That the duties of the department are well performed is indicated by the appearance of the city. More labor is employed by this department than by any other municipal department, there being 1,675 employees during the year 1929-30, with an expenditure of $164,175 for scavenging alone.

Water Department—The public water supply is obtained from impounding reservoirs, three of which are located on the island of Singapore and two on the mainland in the neighboring Sultanate of Johore. In Table III are listed the impounding reservoirs in use or under construction. The water from the first three reservoirs listed in the table is led by gravity through 24-in. and 36-in. pipe lines to the Burkit Timah Road and the Woodleigh slow sand filter plants with daily capacities of 11 and 25 million gallons, respectively. At the

Singapore's rapid sand filter plant

Woodleigh plant, which was completed in 1910, there are nine filter units covering an area of seven acres. Water from these filters goes to two pumping stations—the MacKenzie Road station, with a capacity of 18¾ million gallons per day against a head of 180 ft., and the Woodleigh station, with a capacity of 22½ million gallons per day against a head of 180 ft. The MacKenzie Road station is equipped with reciprocating steam pumps with a capacity of 7¾ million gallons per day and diesel engine-driven centrifugal pumps with a capacity of 11 million gallons per day. The Woodleigh pumping station is equipped with four vertical triple-expansion steam pumping engines. The boilers are equipped to use coal, oil or wood as fuel.

In 1929 the capacity of the water supply was increased by the completion of the Sultan Ibrahim reservoir and dam and the rapid sand filter plant at Tulai. The water flows by gravity from the reservoir to the filter plant for about a quarter of a mile. This plant has a nominal capacity of 12½ million gallons per day and cost $1,000,000 to construct. As a rapid sand filter plant, it is unique in that there is neither mixing chamber nor coagulating basin. The chemicals, lime and alum, are added at the inner chamber and the water flows directly from there on to the filters. Lime is used to aid in the removal of iron, and alum is added as a coagulant. Air and water are used for washing, being applied alternately through the same manifolds. Some trouble is experienced with deposits of iron on and throughout the filters, which causes difficulty in washing and cuts down the length of the filter runs. The filtered water flows by gravity to the pumping station in the city, a distance of 35 miles, through a single steel pipe line with equal lengths of three different sizes, 33, 36 and 39 in. These sizes were used in order that the pipes might be nested for overseas shipment.

The distribution system is laid out to supply the entire city, in which there are no private sources of supply. Information concerning the rate of water consumption is given in Table IV. A supplementary sea water supply is provided to a section of the city for street flushing and other cleansing purposes. In 1928 the consumption of salt water averaged 537,000 gal. per day.

By the construction of the Pontian Kechil reservoir,

Portion of sewage-treatment plant at Singapore

Experimental activated-sludge plant with mechanical agitation by housed paddle wheels of the Sheffield type.

which involved the construction of two earth dams, the capacity of the public water supply is being increased. The main dam is 600 ft. long and will hold water to a depth of 65 ft.; the subsidiary dam is 2,400 ft. long and will hold 45 ft. of water. The Pontian Kechil reservoir is near the Sultan Ibrahim reservoir and the water from the former will be pumped to the new rapid sand filter plant at Tulai. It is expected that the new reservoir will be filled in 1932. Including the Sultan Ibrahim reservoir, the rapid sand filter plant, the Pontian Kechil reservoir, the pumping station and the pipe line to Singapore, the entire cost of the recent extensions to the public water supply is estimated as $12,675,000.

Sewer System—The sewers, which were first put into service in 1914, now serve about 15 per cent of the population on an area of 2,467 acres of the most densely populated part of the city. Additional service is given to 12,000 homes in the city by the collection of night soil therefrom. In densely built-up sections night soil is collected daily and in other parts of the city on alternate days. The collected material is dumped into the sewer.

The sewer system was designed in 1913 by R. Peirce, the municipal engineer. The general scheme was the creation of many small pumping districts rather than an attempt to lay a large deep main sewer. Deep

excavation in the soft saturated muck is thus avoided. At present all sewage is pumped to a treatment plant located on the Singapore River in the heart of the city. The flow of the river is negligible as a diluent, hence the quality of the plant effluent must be high. The plant consists of Imhoff tanks and sprinkling filters with a nominal capacity of 5 to 5½ million gallons per day. An experimental activated-sludge unit, on the Sheffield mechanical aeration principle, has been operating for two years.

Work on extension of the sewage system is constantly in progress, and the construction of a new sewage-treatment plant is contemplated for the near future. Present rate of progress is not rapid, and it will take about 30 years to complete the system.

Other public services that might be classed as municipal engineering include the municipal electric power station, with a maximum load capacity of 7,000 kw.; the municipal gas plant, which has a daily output of approximately 1,000,000 cu.ft.; and those activities of the health department which include anti-mosquito work, municipal abattoirs and markets. It is to be noted that the city parks and the port and harbor construction do not come under the jurisdiction of the municipal government. The great diversity of work for public service by the municipal engineering department of the city government is due partly to the discouragement of private enterprise in these functions and partly to a lack of interest in governmental affairs manifested by a large percentage of the residents.

Expert Testimony on

Wind Design for Tall Buildings—III

* * *

Chord Deflections Control Web System Design

By HENRY V. SPURR
Chief Engineer, Purdy & Henderson Co., New York, N. Y.

RECENTLY, much has been written and spoken on the subject of tower buildings rising 1,000 ft. or more above the street. Such structures challenge American engineering thought, especially since there can be little question that in the next decade or two buildings will be constructed to still greater heights, with the added possibility of lighter floor and wall construction. The most important problem facing the structural engineer is the proper proportioning of these tall structural frames to resist in a satisfactory manner the dynamic effects of wind forces.

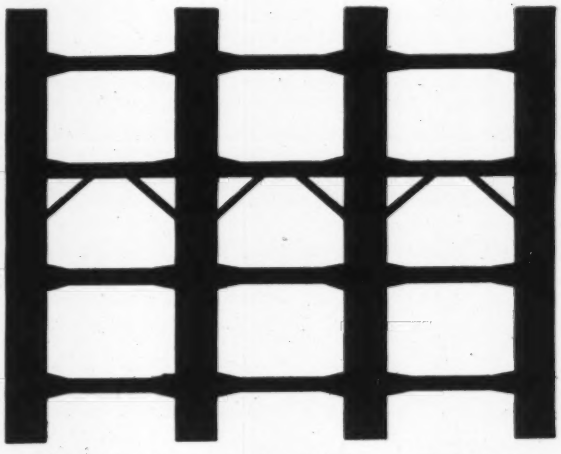
Model Test Data of Limited Value—The uncertainties of the problem are generally understood by engineers who have given any thought to the question, and it goes without saying that more reliable data on wind pressure are greatly desired. Wind tunnel tests should be extended and a proper program adopted to include models of various proportions and scales. Model tests carried out in wind tunnels are of limited value, however, since they can give results only for the exact conditions of the test. These test conditions may not be expected to represent all the varied natural wind effects on actual structures, since there is no way of reproducing in a laboratory the unknown turbulence of natural air currents. For this reason the writer does not think it necessary to introduce great refinement in the carrying out of any such program of tests. Time spent in getting the exact distribution of wind pressure on one model at one wind velocity would be more helpful to the structural engineer if spent in getting the total dynamic effect on many models at various velocities. Whatever may be the exact distribution of pressure for one definite set of conditions, such results are based on a range of observation too narrow to make the precision of the data fruitful for application by the designing engineer to actual problems of construction.

Considerable confusion has resulted in the minds of some engineers from the recording and publication of wind velocities by the Weather Bureau. Generally speaking, those velocities are not actual, but observed, velocities, averaged over an arbitrary unit of time. There are no reliable data on how long natural gusts are in time or in distance, either parallel or perpendicular to the direction of the wind. Data are lacking concerning the changing direction of the wind in the gusts during a storm and concerning the dynamic effect of such change in direction on exposed structures.

The writer believes it will be generally admitted by the most trained observers of the Weather Bureau that recorded velocities and wind pressures, such as have been made by it, have no known relation to the pressures and velocities that would be observed if the recording apparatus were placed in the exposed positions of our tower buildings, without any artificial disturbances of natural wind currents. Observation taken by recording apparatus installed in kites, if carried on over a long period of time, would no doubt give some very reliable information for the range of conditions observed. Even such observations, however, will not cover possible future storms.

Visualizing Wind-Loading Effects

The difficulties inherent in the securing of reliable data on wind effects, as outlined above, have been generally understood for many years by engineers on whose shoulders rests the responsibility for safe, economical and efficient design. These difficulties have been reviewed because there seems to be a disposition to assume that



Columns dominate wind design in the super-tall building

Their size is fixed by live- and dead-load requirements, and it is necessary to adjust the web system by definitely designing it for a predetermined drift.

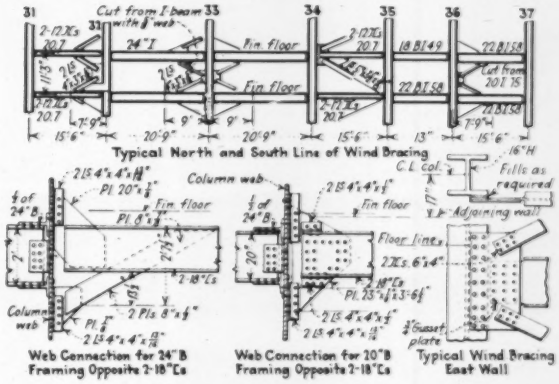
they can be overcome easily in a short period of time and that until such results have been obtained it is of little value to take up stresses and strains, deflections and rigidity.

The writer takes the opposite point of view. The very uncertainties of the dynamic effects of wind pressure on high buildings should influence the designing engineer to visualize the effects of an assumed loading on the frame and to have a clear conception of the physical characteristics of the structure he is designing. Meager as is the information on the actual wind pressures on high buildings, it is subject to intelligent interpretation, with a frank acknowledgment that any loading that may be assumed for the purpose of design is nominal.

Besides the tests on models in wind tunnels and observations by meteorological stations there is another source of information that may prove of considerable value to the structural engineer as time goes on. Reference is made to observations on wind velocities and pressures that may be taken from existing high structures. Such observations, of course, would be influenced by the presence of the structure itself and would have to be interpreted with this fact in mind. In this sense such data will not have definite abstract value but will be concrete to the particular structure. Such observations, carried on together with observations of the elastic behavior of the particular structure itself, should be of great value to the profession.

The possibilities of obtaining reliable data on the dynamic effect of wind, as outlined above, bring out the position in which the structural engineer finds himself with a design problem before him to be solved. Perhaps it is an ordinary structure similar to many that have been built before. On the other hand, it may be of unprecedented height and vary from all previous buildings in shape, dead weight of construction and lightness of exterior walls. In such case it must be admitted that he is thrown largely on his own resources in attempting an efficient economical design to secure adequate stability and strength against future storms, together with correct elastic behavior in gusty winds. The problem is serious enough, in all conscience, without introducing any element of confusion.

An engineer is not responsible for confusion caused by others, but he is to blame if he allows himself to be perplexed through lack of intelligent reflection. Overemphasis on the need for tests to substantiate theory is unwise. Tests may substantiate sound theory, but the results of tests do not necessarily prove or disprove a theory. The question has been raised whether, in a building frame, a plane will remain a plane after bending. This general principle need not be demonstrated by tests, although observations may well determine whether a particular frame so acts. It can be demonstrated by sound reasoning, based on generally accepted principles of mechanics, that if a building frame is properly proportioned and constructed and is subjected to lateral forces, a plane will remain a plane under bending. This can be easily visualized as follows: The columns in a building are independent structural elements, except as tied together by the web system. They will shorten or lengthen in proportion to the axial unit loads introduced by the web system. If the web system is proportioned to introduce the proper vertical loads in the columns, the columns will shorten proportionately in such a manner as to maintain a plane after bending.


Typical North and South Line of Wind Bracing
Web Connection for 24" B Framing Opposite 2-18" Cs
Web Connection for 20" B Framing Opposite 2-18" Cs
Typical Wind Bracing East Wall

Typical wind connections in 900-ft. Manhattan Company Building, New York

Controlling Rigidity

One may go even farther. If a web system is designed and proportioned without attempting to maintain a plane after bending, the deformation of the columns under axial loads will upset the assumed shear distribution and the calculated stresses in all members of the frame as the structure adjusts itself under load, unless this deformation has been considered in the analysis. In this adjustment the structural frame will behave in the most rigid manner possible and depart from the stress conditions of any arbitrary analysis to do so. A combination of several bents, all more or less irregular or different from one another, will present difficulties in analyzing the rigidity of the building frame as a whole, which may become staggering if no attempt is made to control the rigidity by a systematic and correct method of shear distribution, which in turn will govern the design of the web system, based on securing uniform horizontal drift from web deformation in all panels. By doing these things, however, the engineer may easily predetermine and control the rigidity of the frame without involved mathematics.

For the sake of example, we will assume a building 100 ft. square c. to c. of corner columns, with all columns 20 ft. on centers. The building is 100 stories high, and the web system has been designed by the portal method, assuming that only the outside columns carry vertical

wind. The web system has been proportioned by a rigid mathematical analysis to produce this result, without considering the effect of the change in length of the outside columns under vertical wind load. We may now visualize what would happen to the frame if the assumed distribution of stress existed. In the first place, the outside columns away from the wind would shorten, and those toward the wind would lengthen. This means that as we pass upward, floor by floor, there would be a constantly increasing vertical differential between the outside columns and the interior columns. This action would produce slope between the ends of beams connecting the outside columns to the inside columns. Any action of this kind would immediately upset the distribution of shears in the bent, as it would diminish the rigidity of the outside panels to resist horizontal shear. The result of this action would be to redistribute a larger proportion of horizontal shear to the interior panels progressively upward, floor by floor. This redistribution of horizontal shear would be in the direction of maintaining a plane after bending. The elastic behavior of the structure, therefore, is in this direction.

Cantilever Method for Tall Slender Towers

The advisability of using the cantilever method is not dependent upon tests to determine its accuracy. It depends largely upon the proportions of the structure and the degree of rigidity and economy desired by the designer. This method has certain definite advantages to recommend it. In the first place, it will develop the full stability of the structure and the maximum rigidity so far as chord action is concerned. Therefore, if it is desired to obtain a definite rigidity, this method will allow the maximum degree of flexibility in the web system, with consequent economies. The maximum outside-column axial unit stress will be a minimum for a given wind load. The structure will lend itself to exact analysis by this method without involved mathematics. By this method the theoretical rigidity of the frame may be determined most easily and comprehensively. These are definite advantages that become very important in high slender towers.

The conception that a plane may remain a plane after bending will have a profound influence upon the thought of the designing engineer and will assist him as nothing else can toward a more thorough understanding of how the building frame may be expected to act if given a chance to do so. The relative rigidities of various bents will become apparent, and a sensible distribution of horizontal shears will be self-evident. In the analysis of high slender frames there is a great satisfaction in having a clear mental picture of how the different bents may be expected to act together.

Columns Dominate Wind-Design Procedure

In high buildings the tonnage of structural steel in the columns is a large proportion of the total tonnage. The columns are very massive and are the principal elements in the building frame as proportioned for live- and dead-load requirements. The columns dominate the picture, and it is perfectly logical to base the wind analysis on their relative size and position in the frame. It is only by a study of the distribution of column metal in high frames of various height ratios that the designing engineer can sense the significance of extreme height in the problem of wind resistance.

Slenderness or height ratio has a real significance, and the designing engineer may well reflect on the effects of reducing the column metal in a frame of given proportions by a reduction in the loads of construction, by the use of high unit stresses, or by a combination of both.

A thorough consideration of the elastic behavior of high slender frames under any assumed wind load will convince the designing engineer that a consideration of the frame itself is more important than ultra-refinement in the determination of wind loads. Windbracing is not necessarily the expenditure of a certain amount of money for insurance under conditions where the more money that is spent the greater the amount of insurance secured. If it were merely a question of the magnitude of the assumed loads, this would be true, but the facts are quite different.

Nor does the practicable efficiency of windbracing depend upon involved mathematics. Mathematics is an automatic tool that produces a result based on a rigid set-up of assumptions. To the mathematician it is sufficient unto itself for its own beauty and correctness of form. The engineer uses mathematics as a handy tool (if it is handy) in the art of design, which consists mainly in the choice and arrangement of materials to produce a definite physical structure in accordance with his conception of the material requirements to be fulfilled. Many competent engineers make a little mathematics go a long way. All this has been said before, but it will bear repetition at this time because certain mathematical processes have been confused with the theory of windbracing. Generally speaking, these processes cancel out the value of the modulus of elasticity, with the result that the elastic behavior of the structure is forgotten, except for the purpose of determining the requirements of strength. Most of our mathematical methods are too rigid to be adaptable to sound conceptions of the problem of efficient and economical windbracing. For this reason some of these methods will never be used widely by engineers who are concerned with realities.

The writer believes that the greatest hope for the successful solution of the problem of windbracing for very high towers lies in the direction of sound engineering analysis, with a view to determining the approximate theoretical rigidity of the structural frame. Engineers may well differ as to the proper rigidity to secure, but they can hardly dodge the logic of having an opinion.

Buildings constructed with a definite theoretical rigidity may be observed and compared; and through experience an empirical background may be obtained that will largely solve the present uncertainties.

The terms "cantilever method" and "portal method" have been used by writers on windbracing quite frequently. The terms are somewhat misleading, since we are dealing with a cantilever frame in any case. The point at issue, therefore, is not so much one of preference between methods as it is the adoption, where circumstances seem to warrant, of a procedure whereby the analysis corresponds to the actual behavior of the structure, and the design of the web system is carried out with a definite intent to limit its deflection or drift by an economical arrangement of material, consistent with architectural requirements. In designing the web system, all elements contributory to the horizontal movement of any floor past the floor below must be considered, including the flexibility of the connections. In other words, with the columns established by construction requirements, the balance of the frame is proportioned in accordance with a predetermined physical conception of the problem. The engineer, and not mathematics, is at the helm.

Rules for Condition Surveys of Buildings

Forms and directions for surveys of defects in buildings liable to damage from adjacent construction operations

By W. T. McINTOSH
Engineer, Spencer, White & Prentis, New York, N. Y.

A CONDITION SURVEY should invariably be made of all buildings that offer possibilities of damage by shock, settlement or other movement caused by construction adjacent to or underneath them. Few buildings endure long without defects. Often these are unrecognized or overlooked by the owner until the jar and rumble of adjacent construction excites his anxiety and search, and he promptly files claims for damages. Constructors have time and again paid such damages aggregating in cost many times the expense of condition surveys that would have protected them. The examination, however, must be made with great care or it may prove a source of loss instead of saving. Since it is made for the purpose of recording the defects existing on the building before work starts on the adjacent structure, any defects discovered at a later date must be assumed to have occurred since the examination.

In every case the constructor should himself have the survey made or be represented by a keen examiner where a public works department or commission conducts the survey. Ordinarily the latter agencies are not directly involved financially and are correspondingly less interested and keen than the contractor whose inattention or oversight will take good money out of his pocket. It is well if possible to have all interested parties—the owner, his engineer or architect, agent and contractor—represented in the survey and attest to its accuracy by signatures. All representatives should be engineers capable of making independent examinations and not merely impassive witnesses to the proceedings.

The purpose of the survey is to provide a document of record and constant reference. The record therefore must be systematic, orderly and easy to interpret as well as accurate. Examples of records are given in the accompanying illustrations. The surveyor should have a flashlight, rule and camera and be assisted by a stenographer to take notes. His order of examination should be uniform for every building and room so that field notes may be accurately and easily interpreted for the record. The following rules worked out from extended experience will cover the requirements of most condition or defect surveys.

Rules for Making Reports

1. The kind and location of building, date of examination, owner, parties interested in the examination and their representatives should be stated.

2. Divide report into exterior, north face, east face, etc., and interior, basement, first, second, third floors, etc., as indicated in the outlines of report, Fig. 2.

3. Attach to the report at least one photograph of the exterior, preferably the front face. If a side adjoins the construction work or if there are defects in the exterior, additional photographs may be worth while.

4. If the building has anything but the simplest floor plan, make a sketch of a typical floor, such as Fig. 3, so that the designation of the rooms by description will be clear.

5. Number each unit of subdivision of the structure to emphasize the subdivisions and to avoid overlooking any of them when reading the report.

6. Describe each face of the exterior by direction and also by its location in the buildings, such as (1) north face (front); (2) east face (side), etc.

7. Describe each room by its location and use, such as (7) northeast room (dining room); (8) room south of northeast room (bed room), etc.

8. If a room has two parts, state it, as "including alcove on east side," or "divided near center by a grille." This will eliminate any question as to whether the parts are taken together or treated as separate rooms.

9. Describe the exterior first, then the cellar, then the floor above the cellar, then the floor above, etc., to the top.

10. In the interior take the rooms in a regular order and in the same order on each floor, for instance: vestibule, hall, north room, room south of north room, etc.

11. Divide stair halls at floor lines and so state, as: first-floor hall and stairs to second floor (from floor line to floor line).

12. In each room describe the floor first, then north wall, east wall, south wall, west wall and then ceiling.

13. Whenever possible, examine the girders in the cellar and their seats on walls and columns. Also examine floor beams (if visible) especially under bathrooms and kitchens where water may have come down and caused rotting. If defects are noted in girders or beams, keep a lookout for resulting defects in the floors and walls above them.

14. Always record separations between floors and baseboards if they exist, and they usually do. Owners

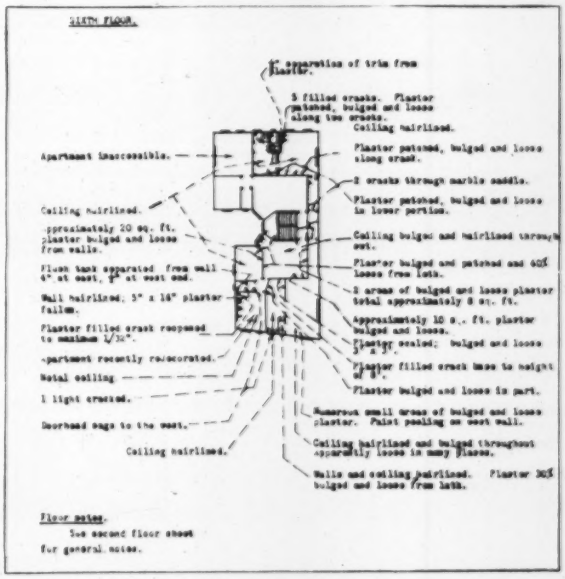

SIXTH FLOOR.
Separation of trim from plaster.
5 filled cracks. Plaster patched, bulged and loose along the cracks.
Ceiling hairlined.
Apartment inaccessible.
Plaster patched, bulged and loose along crack.
2 cracks through marble saddle.
Plaster patched, bulged and loose in lower portion.
Ceiling hairlined.
approximately 20 sq. ft. plaster bulged and loose from walls.
Ceiling bulged and hairlined throughout.
Floor tank separated from wall 4" at east, 2" at west end.
Plaster bulged and patched and 60% loose from lath.
Wall hairlined, 3" x 16" plaster fallen.
2 areas of bulged and loose plaster total approximately 8 sq. ft.
Plaster filled crack reopened to maximum 1/32".
Approximately 10 s.. ft. plaster bulged and loose.
Plaster sealed; bulged and loose s. f.
partment recently redecorated.
Plaster filled crack base to ceiling 3'-0".
Metal ceiling
1 light cracked.
Plaster bulged and loose in part.
Overhead cage to the west.
Numerous small areas of bulged and loose plaster. Paint peeling on west wall.
Ceiling hairlined.
Ceiling hairlined and bulged throughout, sparsely loose in many places.
Walls and ceiling hairlined. Plaster 30% bulged and loose from lath.
Floor notes.
See second floor sheet for general notes.

Fig. 1—Report form employed by firm of specialists in building surveys

frequently are not cognizant of their existence until near-by construction calls attention to them, and then they attribute them to the construction work.

15. Note particularly floors and heads of door and window frames out of level. In old buildings these conditions occur most frequently adjacent to stairways and to interior partitions carried on floor beams or girders.

16. Note particularly stairs out of level and stairs pulled out of their mortises in the wall string. This is a frequent defect in old buildings.

17. Note any wainscots, chair rails or picture molds that indicate, where they meet at corners of rooms, that one wall has settled with respect to the other.

18. Note separations between wood mantels and chimney breasts, hearths cracked or sunk below adjoining floors, etc.

19. In describing cracks at intersections of walls and at intersections of walls and ceilings, record them under the wall that appears to have moved—if this can be determined, as it usually can by cracks branching out of the intersection. For example: East wall. Crack at intersection with south wall open $\frac{1}{8}$ in. from base to 1 ft. below ceiling and thence diagonally across east wall to ceiling.

20. Always state width of cracks and approximate length, as: hairline crack, 3 ft. long; crack open $\frac{1}{64}$ to $\frac{1}{32}$ in., full width of room. Without this information it is impossible to determine on later examination whether or not conditions are worse. When it is pointed out to an owner that a given crack existed when the original examination was made, the owner will almost invariably reply. "But it wasn't as large as it is now."

REPORT OF EXAMINATION OF BUILDING
AT 66 ELM ST., BROOKLYN, N. Y.

MADE MARCH 1, 1930

Building: Two story and basement, brick, private residence.
Owner: Mr. John H. Smith, 66 Elm Street, Brooklyn, N. Y. (Represented by Mr. John Smith.)
Foundation Contractor: Concrete Construction Co., New York. (Represented by Mr. Richard Roe.)

EXTERIOR

1. North Face (front): Brick. See photograph attached.
   Basement Story: Crack in sill of east window open, etc.
   First Story: Pointing missing between lintel of west, etc.
   Second Story: No remarks.
2. East Face (side): Obscured by adjoining building.
3. South Face (rear): Brick, etc., etc.
4. West Face (side): Obscured, etc., etc.
5. Roof: Flat, covered with felt and asphalt, etc.

INTERIOR

6. Cellar: Comprises one room, no partitions. Concrete floor, rubble foundation walls, ceiling plastered on wood lath.
   Floor: Slightly uneven throughout. Hole about 1 ft. etc.
   North, east, south and west walls: No remarks.
   Ceiling: Plaster fallen from area 5 ft. x 6 in., etc.

BASEMENT

7. Hall and Stairway to First Floor (from floor line to floor line):
   Wood floor, walls have wood wainscot 3 ft. high, plastered and painted above, ceiling plastered and kalsomined.
   Floor: $\frac{1}{4}$ in. separation between floor and base, etc.
   North Wall: $\frac{1}{16}$ in separation between floor and base and at intersection with east wall from base to ceiling, etc.
   East Wall: Hairline diagonal crack from south, etc.
   South Wall: No remarks.
   West Wall: Crack at intersection with ceiling, 3 ft. long, open $\frac{1}{16}$ in. maximum, etc.
   Ceiling: $\frac{1}{64}$ in. crack running diagonally from, etc.
8. North Room (dining room): Wood floor, walls plastered and papered, ceiling plastered and kalsomined.
   Floor: No remarks.
   North Wall: Crank in cove at ceiling intersection, etc.
   East Wall: Etc., etc., etc.

Fig. 2—Simple survey record recommended

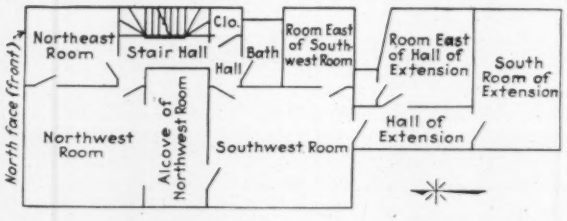


Fig. 3—Sketch plan recommended for irregular interior

Nothing can convince him that it was, unless the magnitude is stated in the report.

21. If wall paper at wall intersections shows wrinkles, particularly diagonally, or if the paper cuts diagonally across the corner instead of fitting tightly into the corner, the probability is that there is a crack in the intersection behind the paper. In the same way wrinkles in wall paper on flat walls indicate probable cracks. Describe such conditions in the report.

22. Record all water stains on ceilings and walls. The plaster is very apt to be softened by the water and may fall. Falling plaster is frequently blamed on near-by construction when it is really due to softening by leaks. Furthermore, leaks may be blamed on construction unless there is definite evidence to the contrary.

23. For each unit of the building, such as floor, east wall, ceiling, etc., if no defects are found, state in the report: "No remarks," or "Nothing noted." This will eliminate all question as to whether that part of the building was examined.

24. The report of a re-examination should begin with the general statement: "Only the differences between the conditions as described in the report of examination made on (date) and the conditions as they exist today are described in this report."

25. In a re-examination always follow the same order as in the original examinations, use the same numbers for rooms, etc., and the same designations as: (7) northeast room (dining room).

Future of New England Railways

In the scheme of eventual consolidation of railways into a relatively few large systems, should the railways of the New England states be organized into an independent system or should they be absorbed in a general Eastern system? This was the problem submitted to a committee appointed in 1929 by the governors of the six New England states. A majority report of the representatives of five states approves the former or independence plan (two of the 25 members dissenting), while a minority report for the sixth state favors the absorption plan. Both reports deal principally with the proposed consolidation of the Boston & Maine and the New York, New Haven & Hartford. In the majority report stress is laid on the large investments of the Pennsylvania in these two railroads. It recommends that they should be freed from such "excess ownership" of their stocks by the Pennsylvania. Then, but not until then, these two roads should be consolidated, but with the condition that no railway may acquire stock in the New England railways without approval by the commission. The minority report states that extension of the Eastern trunk-line system into New England is desirable for industrial growth and that consolidation of the two principal New England lines is undesirable.

Breakwater Construction for New Type of Great Lakes Harbor

Outer breakwaters replace piers and narrow channel—Concrete caissons for main part—Pile and concrete ends

A RADICAL CHANGE in type of harbor entrance, which is being made at Frankfort, Mich., and some other ports on the east shore of Lake Michigan, consists in replacing the old narrow channel between parallel piers with an entrance of the modern arrowhead type, consisting of a triangular bay inclosed within breakwaters. The special purpose is to facilitate navigation, as in storms or heavy ice conditions it is not easy for a steamer to enter this narrow channel. When the long narrow channel is choked with ice driven in by the wind, even the large car-ferry steamers which are built as ice breakers have difficulty in entering.

At Frankfort the piers, built some 60 years ago, are of stone-filled timber-crib construction, about 1,800 ft. long and 200 ft. apart. As at other ports on that side of Lake Michigan the harbor is on an island lake formed by a river which breaks through the sand hills that form the coast line. This is indicated in Fig. 1, which shows graphically the bay that will be formed by two breakwaters, which are about half a mile apart at the shore and converge to a 400-ft. harbor entrance. The south breakwater is being built first as a protection against southwest storms, which are the most serious for east-shore ports at the northern part of the lake. Two types of breakwater construction are included. The outer or deep-water part, 1,200 ft., is built of hollow concrete caissons sunk on foundation piles and a broad mattress of broken stone. The shore part, 1,400 ft., consists of two rows of wood piles and sheeting with stone fill between. Both types have a concrete superstructure and are protected by riprap along the lake and harbor sides.

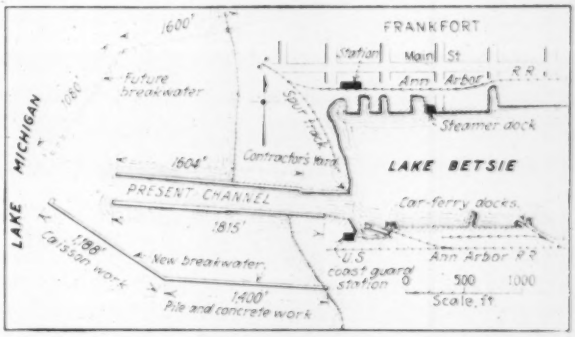


Fig. 1—Harbor works at Frankfort, Mich.
Bay inclosed by breakwaters will replace narrow channel between piers.

Foundation for Caissons—For the outer part of the breakwater, Fig. 2, piles 50, 44 and 40 ft. long are driven to depths of 20 to 30 ft. in the lake bed and cut off at 19 or 15 ft. below low water or datum, according to the sizes of the caissons. In general, they penetrate about 7 ft. of sand, a 1-ft. layer of clay and then 12 ft. or more of sand and gravel underlain by a stiff hardpan bed. These piles are square fir timbers 12x12 in. with blunt diamond points. The parts cut off are utilized as wales and binders in the shore connection. The stone mattress has a maximum thickness of 6 ft. under the caissons, beyond which it is 3 ft. thick for a width of about 60 ft. on both the lake and the harbor sides of the structure. It consists of a graded mixture of relatively small stones, so that the voids are well filled in order to reduce the tendency of the riprap to sink into the sandy bed of the lake under the influence of heavy wave action.

Caissons—These precast concrete caissons (Fig. 2) are of the trapezoidal type which has come into extensive use at Lake Michigan harbors in recent years. The largest are 24 ft. wide at bottom, 10 ft. at top and 21 ft. high. The 54-ft. length is divided into four compartments by cross-walls. The caissons were made at the plant of the U. S. Engineer Office at Milwaukee, Wis., and were towed to Frankfort, being fitted with watertight covers.

When a caisson is to be sunk it is held between two derrick boats placed alongside the last caisson placed, while its outer end is attached to buoyed anchors with cables, enabling it to be held on line. After being leveled with a little stone ballast it is sunk slowly by water pumped in by one of the boats, the filling being regulated to allow exact adjustment to line as the caisson comes to a bearing. The line is determined by a transit set back on the completed portion of the breakwater and sighted on a shore mark and a mark at the far end of the caisson which is being sunk.

Stone ballast in pieces weighing 10 to 200 lb. is then dumped into the caisson to within 3½ ft. of the top, and after being leveled it is covered with burlap. A 6-in. layer of concrete on this burlap is usually specified, but on this work the concrete was filled to within 6 in. of the top of the caisson and provided with heavy steel rods or dowels to anchor the superstructure. Forms are fitted to the caissons for the concrete superstructure, which rises 6 ft. above datum. The 54-ft. lengths are separated by ¼-in. felt joints, but in each group of three caissons the superstructure blocks are connected by 7-ft. dowel rods. Ladders and mooring posts are provided at intervals.

Riprap Protection—As soon as a caisson is sunk in place it is protected on both sides by dumping the first portion of the riprap to a height of 3 to 6 ft. above the bottom of the caisson to prevent displacement or swaying on the piles due to wave action. This stone is dumped while the interior stone fill or ballast is being placed. As soon as possible the riprap is deposited to its full section, with the top 2 ft. above datum and a slope of 1 on 2 to the stone mattress. The inner portion of this riprap is composed of stones weighing 50 to 2,000 lb., but the outer slopes are faced with large stones weighing

as much as 10 tons each. As the stone mattress extends 15 to 25 ft. beyond the toe of the slope, the riprap is protected against settlement due to scour. The riprap protection of this caisson breakwater is unusually massive because of the severe exposure.

When the first caisson was sunk at Frankfort in 1928, this being at the outer end, the riprap was not placed immediately. During a heavy storm the caisson was forced off its foundation and submerged about 5 ft., but fortunately it was not upset. A dredge with clamshell bucket removed a large part of the stone ballast from the caisson, and divers then put on a watertight plank cover, with pipes projecting above water for hose attachment to pumps and for admitting air as the water was removed. In this way the caisson was given sufficient buoyancy to enable it to be towed into the harbor. Experiments with wave effects upon riprap and caissons are now being conducted with models at the U. S. Engineer Office in Milwaukee.

Shore Connection—In the shore section of the breakwater, extending from the caisson work to the shore, the substructure consists of two rows of round piles about 14 ft. c. to c. and two lines of triple-lap wood sheeting with stone fill between them, as shown in Fig. 3. Tierods pass through waling timbers along the top of the piling, and upon these timbers are nailed boards which fill the spaces between the round piles and form a floor or deck for the superstructure, consisting of two concrete walls connected by cross-walls about 7 ft. apart. The concrete is anchored in place by vertical drift-bolts projecting from the wales.

This concrete superstructure extends 6 ft. above water, and its compartments are filled with stone, but a 4-ft. central walk is provided by concrete slabs seated in the cross-walls. Riprap is deposited along both sides of the substructure, but as this is in comparatively shallow water the stone is carried up only about three-fourths the depth of the water.

Formwork—Forms for the solid concrete superstructure over the caissons are wood panels having hook bolts along the inner side at the bottom to engage dowel rods projecting from the top of the caisson walls. Burlap and duck are calked between the form and the caisson to make a watertight joint. The posts of these panels were tied together at the top by rods, while timber spreaders held them the proper distance apart. Bulkheads formed the ends of the forms. After the concrete had been struck off level it was finished with wood floats. As the side panels were about 2 ft. above the concrete, or about 8 ft. above water, they protected it from spray, but in heavy weather a timber cover was placed over the form.

For the cellular concrete superstructure on the shore end the outside forms are similar to those described, the panels being attached to the waling timbers. Inner collapsible forms are used, Fig. 4, built in four sections, with sheeting nailed to posts. These sections are put together with bolts through their adjacent posts, shores which act as spreaders being fitted between the posts. At the points of contraction the ends of the sheeting planks are beveled to form a dovetail groove between adjacent sections. This groove is closed with a beveled plank, backed by the shores and spreader blocks. Longi-

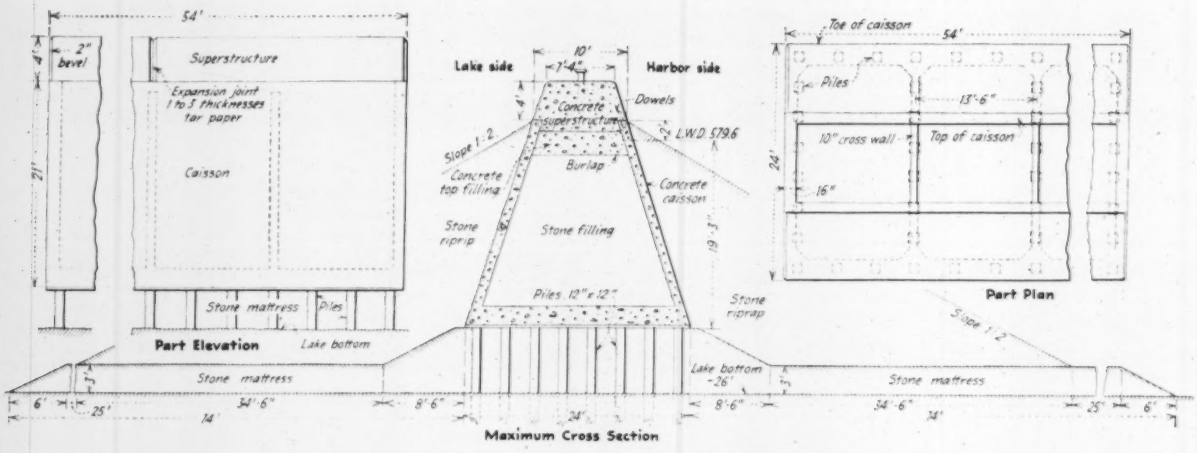


Fig. 2—Breakwater of concrete caisson construction

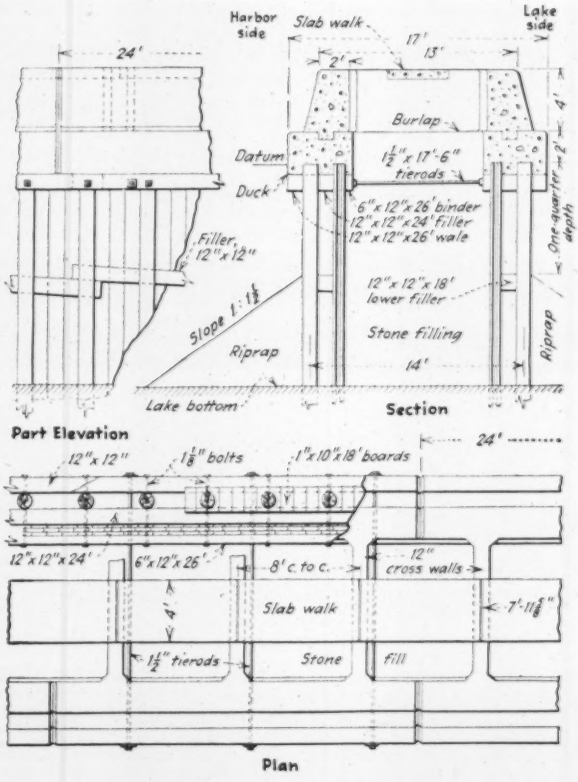


Fig. 3—Pile pier with concrete superstructure

tudinal and cross-shores between the posts hold the sides in place. After the concrete has set, these shores are removed and the beveled planks are drawn up, so that the form is loosened and can be taken out in one piece by a derrick boat.

Construction Work—Sand, gravel, broken stone for concrete and the smaller stone for riprap and mattress were delivered at the contractor's yard by a steamer having two revolving cranes to handle clamshell and orange-peel buckets, and a long ladder frame with conveyor belt for delivering broken stone, sand or gravel into stockpiles on shore.

Stone for the mattress was placed by dump scows. Stone for the caisson filling and the main mass of riprap was placed by means of wood skips handled by a derrick barge. In the yard the stone was piled by hand on these skips, which were then stacked on a barge by the derrick. When the barge was towed into position a derrick boat picked up a skip by slings hooked to rings at the four corners. A second holding line was also attached.

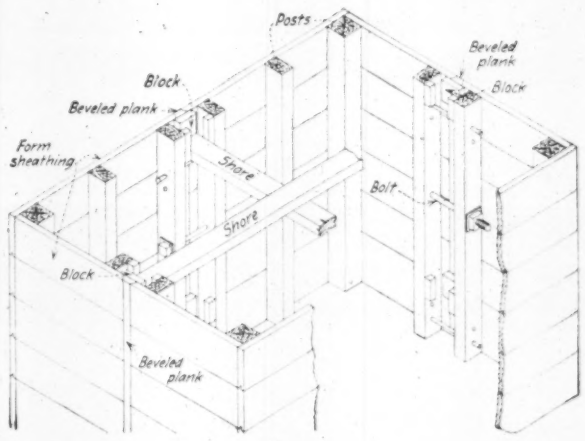


Fig. 4—Collapsible form used on breakwater

With the skip swung out to position the main cable was slacked, allowing the holding line to tilt the skip so that it dropped its load.

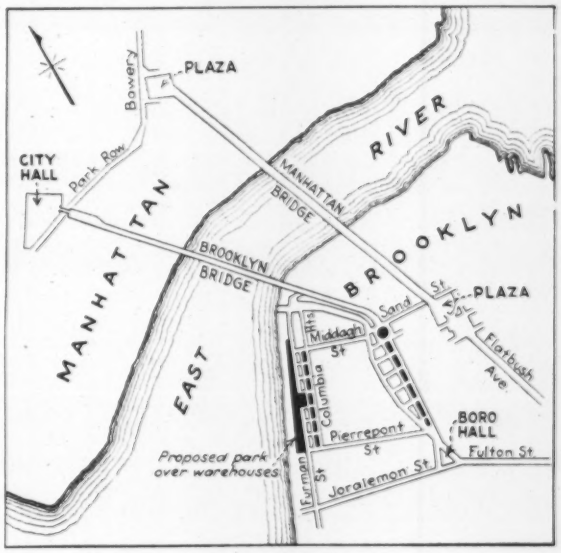
The large quarry blocks for facing the riprap slopes were delivered by rail and were unloaded by a crane with a chain sling having stone hooks at each end to engage the rough surface of the block. A derrick barge loaded them on its deck, and when towed into position it unloaded them in the same way. These blocks were not dropped but were lowered until they rested on the riprap slope. The floating concreting plant consisted of a barge with steam derrick, mixer and material bins, which were loaded from a barge. The sacks of cement were piled on a platform above the mixer. Concrete was placed mainly by a drop-bottom bucket. A crew with small derrick barge placed and removed the forms.

As the sinking of caissons, placing of riprap and concreting of the superstructure could be done only when the water was fairly smooth, the work was subject to frequent interruption.

Engineers and Contractors—The design and execution of this harbor work have been under the direction of Lieut. Col. John J. Kingman and Major H. M. Trippe, Corps of Engineers, U. S. Army, district engineers at Milwaukee, Wis., with E. M. Nisen as senior engineer. The contracting firm is the Waterways Engineering Co., Green Bay, Wis., formerly the Greiling Engineering Co.

Brooklyn Regional Plan Proposals

SEVEN major proposals are made for Brooklyn in the Regional Plan of New York and Its Environs. Three are wholly new, having been developed only recently. Harold M. Lewis, engineer of the Regional Plan, in describing them to the Brooklyn Chamber of Commerce recently, stated that the Regional Plan had offered Brooklyn two things: (1) a general plan for communication and land uses (this was published in 1929, and many elements have been officially adopted and are being carried out); (2) suggestions for building and rebuilding, including standards for guiding building growth and



Proposed improvements for Brooklyn

for the relationship between building space and public and private open space. These are to come in the forthcoming final plan volume. The three new specific suggestions for improving certain areas are:

First, an esplanade extending from the Brooklyn Civic Center and downtown business section northerly, constituting an imposing approach-way between Borough Hall and Brooklyn Bridge.

Second, widening Columbia Heights between Middagh St. and Pierrepont St. to 120 ft., creating an avenue with central parkways. On the reconstructed roofs of the warehouses on the waterfront opposite this widening there would be laid out a public park accessible by bridges at the ends of the streets. The roofs are level with Columbia Heights.

Third, a marginal railroad to serve industrial areas along the waterfront.

African Transcontinental Railway

An African transcontinental railway has become an accomplished fact with the completion in March, 1931, of an extension of the Benguela Railway, which runs from the port of Benguela, on the west coast, to a connection with the Katanga Railway in the Belgian Congo. The latter road is already connected with the Rhodesian Railways, which in turn are connected with the Beira Railway, giving access to the port of Beira on the east coast, and with the South African government railways, giving access to Cape Town on the south.

ENGINEERING LITERATURE

A Monthly Review of Books and a Listing of New Publications

Highway Economics

REVIEWED BY W. A. VAN DUZER
Director of Vehicles and Traffic, Washington, D. C., after June 30; Lately Assistant Chief Engineer, Pennsylvania Highway Department

HIGHWAY ECONOMICS—By Sigvald Johanneson, M.Am.Soc.C.E., M.Inst.C.E., M. Danish Soc.C.E., Engineer of Design, New Jersey State Highway Department. New York and London: McGraw-Hill Book Co. Cloth; 6x9 in.; pp. 157; line drawings and tables. $2.50.

IN "HIGHWAY ECONOMICS" Sigvald Johanneson addresses himself to highway officials and engineers. He presents an orderly arrangement of connected facts and arguments relating to an important but seemingly little understood subject.

There is discussion of theory for those who wish to brush up on the fundamentals of highway economics, and there are tabulations and examples for those with highway economics problems to solve. The theories outlined are sound and the tabulations and examples are carefully arranged and easily understood.

The guiding principle presented "that the road user pays ultimately either directly or indirectly for highway surface" is inescapable. Cost and benefit comparison is essential and should undoubtedly be premised largely on future traffic conditions, as Mr. Johanneson says.

Data in the book have been gathered from broad experience with keen perception, although, as stated, for direct application figures must be modified to fit a particular locality. Construction costs are discussed with especially good understanding of the right-of-way problem. Maintenance costs are quoted comprehensively from New Jersey and Pennsylvania records and as such are fairly representative of high-class work.

Motor vehicle operating costs are recognized by Mr. Johanneson as a significant factor in highway economics. There are always sources of argument in the differences in costs of operation as between fleet owners, individual commercial operators and other operators, as well as in the differences in operation costs in various sections of the country, including differences in traffic classification; but the methods of analysis used by Mr. Johanneson and the representative costs that he instances are illuminating. The money value of one vehicle-minute of delay in itself is apparently insignificant, as is also the question of a motor vehicle traveling a few hundred feet of extra distance or a motor truck climbing a hill, but in the aggregate these trifles may justify large expenditures for improvements. These points are covered in a logical and interesting manner in the book.

The closing chapters—on density of traffic, capacity of highways and associated problems of highway, railroad and waterway crossings—illustrate the recent and present traffic problems in one state that may be the future problems of another, and so are well worth the time and study of every forward-looking highway official or engineer.

Summarizing, the book contains a number of interesting discussions of up-to-date problems and a great deal of concise information, and I unhesitatingly recommend it to the student, highway engineer or highway official who is interested in keeping abreast of the times.

Engineering Progress Visualized

CONTROL: A Pageant of Engineering Progress—Written and Directed by George Pierce Baker [Department of Drama, Yale University]. New York: American Society of Mechanical Engineers, 29 West 39th St. Boards; cloth back; 6x8 in.; pp. 63; 10 illustrations, $1.35.

FIVE epochal incidents in the development of engineering were a feature of the celebration of the 50th anniversary of the founding of the American Society of Mechanical Engineers last year. Appropriately, they were staged in the auditorium of the Stevens Institute of Technology, where the society had its first meeting, and with equal propriety one of the scenes (the third) visualized that meeting, with a presentation of Worthington in the chair. The opening scene pictured the momentous decision of Bouton to finance Watt's steam engine. Next came George Stephenson before a parliamentary committee, supporting his project for a railway between Manchester and Liverpool, where his proposal to carry the road over the peat bog known as Chat Moss was derided. Faraday demonstrating electromagnetic induction at Oxford University, in 1832, and persisting in his devotion to scientific research in the face of commercial offers, made the third scene.

Finally came a street view with Edison and others witnessing the appearance of electric lights in a building. Throughout the pageant, a number of symbolic characters appeared and spoke: Mystery, Curiosity, Intelligence, Imagination, Control (child and mature), Finance and, last of all, Beauty. Prof. Baker's text and the accompanying illustrations might well be put in the hands of every engineering student during his college course and deserve the attention of the engineering profession generally. There is ample opportunity for similar pageants, fathered by other branches of engineering.

From a Breaker of Architectural Idols

MODERN ARCHITECTURE: Kahn Lectures for 1930—By Frank Lloyd Wright. [Princeton Monographs in Art and Archaeology.] Princeton, N. J.: Princeton University Press. London, England: Humphrey Milford, Oxford University Press. Picture boards; 8x11 in.; pp. 115; halftones. $4.

THERE is much in Frank Lloyd Wright's "Modern Architecture" that should appeal to engineers as well as to architects. Throughout, it urges the use of building materials in a way true to their nature and the design of structures to serve the uses to which they are to be put and to meet the spirit of the age and in general the adaptation of form to function.

The titles of the six lectures are: "Machinery, Materials and Men"; "Style in Industry"; "The Passing of the Cornice"; "The Cardboard House"; "The Tyranny of the Skyscraper"; "The City." The author does not decry either the machine or the skyscraper but would utilize each under reasonable control for the benefit of man. He comes nearest to bitterness in his protests against the use of the cornice when it has no structural function but is continued as a mere tradition of a past architectural age: first a copy in stone, without a useful function, of what was originally wrought in wood, for utility; then, for a long time, a mere sham of shaped metal; but fortunately done away with of late in many

of the best buildings. He scores the Romans for being ashamed and hiding by masks one of their greatest contributions to building construction, the arch.

The author is well known by many as an advance agent of reform in architectural thought and practice; in fact, a veritable iconoclastic or smasher of ancient architectural idols—he interprets A.I.A. as "Arbitrary Institute of Appearances." This is well illustrated by the fact that a large part of the first of these lectures was first delivered 28 years ago, at Hull House, Chicago, under the title, "The Art and Craft of the Machine." In manufacture, the book is in keeping with artistic principles which it so ably presents—but a type line a little over 5½ in. long is more conducive to the appearance than to the easy reading of the book.

Buildings in the City and Regional Plan

BUILDINGS: Their Uses and the Spaces About Them—[Regional Survey, Vol. VI.] Three Monographs: (1) The Character, Bulk and Surroundings of Buildings, by Thomas Adams; (2) Housing Conditions in the New York Region, by Thomas Adams in collaboration with Wayne D. Heydecker; (3) Control of Building Heights, Densities and Uses by Zoning, by Edward M. Bassett. Assisted by Harold M. Lewis and Lawrence M. Orton. New York: Regional Plan of New York and Its Environs, 130 East 22d St. Cloth; 8x11 in.; illustrated. $3. [Advance subscription price for the eight Surveys and the two Plan volumes, including map for mounting, $50.]

PUBLICATION of the most extensive and intensive regional surveys ever made is completed by the report entitled "Buildings: Their Uses and the Spaces About Them," recently issued by the Regional Plan of New York and Its Environs. The volume is the eighth, chronologically, and No. 6 in the series. It includes three monographs dealing with (1) buildings in general, (2) housing and (3) zoning—described in more detail by the transcript from the title page, given above. Yet to appear is the second and concluding volume of the "Plan," which, we are informed officially, "will contain a number of proposals for specific projects in various parts of the region."

The present volume treats in detail, with copious documented citations and with halftones and drawings, the various aspects of the sub-topics already mentioned. While the three monographs properly center on the New York region, they draw largely from other areas and are of wide application. The skyscraper and its problems are given much attention, but stress is laid upon the fact that bulk rather than height of buildings creates or accentuates most of the problems commonly attributed to height alone. Economic aspects of housing that are discussed include the general failure to apply mass production methods to the production and placing of house-building materials. The monograph on zoning is comprehensive.

The volume, like others in the series, deserves wide circulation among all who are or should be concerned in city and regional planning, including a host of city officials who thus far have sadly neglected a subject of rapidly growing importance.

Stresses in Arch Dams

ON THE STRESSES IN ARCH DAMS—By Charles Worthington Comstock, 395 Riverside Drive, New York City. Paper: 6x9 in.; pp. 30; 1 line cut. Address the author.

THERE is no pretense of finality in this paper, according to the author's introductory statement. It is simply a solution, free from vitiating assumptions, of an essentially preliminary problem—namely, the stresses in a circular elastic arch under uniform normal pressure on the extrados, subject to the limitations imposed by ignorance of the properties of the material composing the structure. The paper, the author states, harks back to the fundamental differential equations of the mathematical theory of elasticity and seeks a solution free from any assumption as to stress distribution.

Government of the United States

THE AMERICAN LEVIATHAN: The Republic in the Machine Age—By Charles A. Beard, Sometime President of the American Political Science Association, and William Beard, B.S., Massachusetts Institute of Technology. New York: The Macmillan Co. Cloth; 6x9 in.; pp. 824; halftones. $5.

CONSIDERED as a book for the general reader, as the authors intend, "The American Leviathan" is the most comprehensive and searching description of the government of the United States that has yet appeared. It is unique in the attention it gives to engineering and other technological matters, not so much by the way of detailed presentation as by showing how they have added greatly to the complexity of all phases of government. This is emphasized by the sub-title, "The Republic in the Machine Age," and more specifically by the opening chapter, on government in a technological society. These titles should neither frighten away the general reader or raise undue hopes among engineers and other technologists, for technological subjects are not taken up in technical language or in detail but chiefly in an illustrative way. In fact, some of them are treated so briefly as to be likely to mislead the uninformed. This is notably true of the page on litigation over the effect of the Chicago drainage canal diversion on navigation in the Great Lakes, but here and elsewhere the main bearings of the discussions on the points to be illustrated are clear. Condensation throughout is imperative in a one-volume book on so large a subject as the government of the United States in its constitutional and other fundamentals and as a great and highly diversified working mechanism well into the twentieth century. The condensation is remarkably well done and is accompanied by a constant stream of interpretative comment and criticism that makes the book enjoyable and stimulative. Father and son deserve commendation for their joint work.

Machine Tool History

LUDWIG LOEWE & CO., 1869-1929—By C. Matschoss and G. Schlesinger. Berlin: VDI Verlag. Cloth; 8x11 in.; pp. 212; ten plates, of which eight are portraits after drawings by H. Turner; 139 halftones and line cuts in the text. 15 marks.

MANY brilliant chapters of technological history are to be found in the record of growth of individual manufacturing or construction companies, but only too rarely are these records compiled and made part of technical literature. An account of the growth of the German machine tool firm of Ludwig Loewe makes an important contribution to recorded history, because of the subject matter and also because of the authors, both of whom have previously contributed extensively to the literature of mechanical development. Dr. Matschoss' enlightening story of the growth of the company, beginning in 1869 with the project to take up the manufacture of sewing machines by American production methods—then creating a new era in machine method—and on to the expansion into small arms and precision tool production, is a worthy companion piece to his previous historical writings. Prof. Schlesinger's study of the production and management methods of the company is no less informing and readable. Because the house of Loewe

throughout its history drew largely on American sources for its inspiration as to method and design, this particular chapter of the German machine art is of peculiar interest to American readers. Throughout all stages of its growth the work of the firm was closely interwoven with the entire fabric of modern industrial history.

Application of Power to Farming

THE CENTURY OF THE REAPER: An Account of Cyrus Hall McCormick, the Inventor of the Reaper; of the McCormick Harvesting Machine Company, the Business He Created; and of the International Harvester Co., His Heir and Chief Memorial—By Cyrus McCormick. Boston and New York: Houghton Mifflin Co. Cloth; 6x9 in.; pp. 307; illustrations. $3.50.

FROM the invention and building of a horse-drawn non-binding reaper in his father's blacksmith shop in Virginia to the quantity production of the motor-driven reaper and thresher combined is a long step in the progress of agricultural industry. Within that period other momentous changes in farm implements have been made. The part taken by three generations of McCormicks in these changes, as well as the evolution of the main steps in the perfection, manufacture and sale of the implements, is interestingly told in "The Century of the Reaper," by the grandson of Cyrus Hall McCormick. The book also shows the part the reaper has played in a mechanical and urbanized world. Particularly interesting are the stories of standardization and mass production at Chicago as early as the middle of the last century and the creation and growth of the International Harvester Co. in this century, including the broadening of its field to include a wide range of farm implements and applies, notably the farm tractor. The book is a valuable contribution to the history of industry and bears eloquent testimony to the human qualities shown by the leaders in this field.

Development of Colorado River

COLORADO RIVER AND THE BOULDER CANYON PROJECT: Historical and Physical Facts in Connection With the Colorado River and Lower Basin Development—By the Colorado River Commission of the State of California, F. H. McIver, Secretary. Sacramento: Colorado River Commission. Paper; 6x9 in.; pp. 400; maps and tables.

THOSE who seek information concerning the long history of the development of the Colorado River leading up to the construction of Hoover Dam will find themselves indebted to the Colorado River Commission of the State of California for its complete compilation of the legislation which preceded the passage of the Boulder Canyon dam act. The report, in addition to the legislative matter, contains a very full historical synopsis of the exploration and development of the Colorado River basin with references to government publications and to books in which more complete information may be found. Numerous maps and charts are included, as is a bibliography of articles concerning the river and related projects, classified according to authors, and a complete list of congressional reports on the Colorado River and of the many articles published in *Engineering News* and *Engineering News-Record* from 1902 to 1930, inclusive.

Aid to Effective Drawing

ARCHITECTURAL SHADES AND SHADOWS—By Edgar Green Shelton. New York: D. Van Nostrand Co. Cloth; 8x11 in.; pp. 159; line cuts and halftones. $3.75.

INTELLIGENT attention to shades and shadows in an architectural drawing is an asset. A study of the many different methods used in the solution of shadow problems has led the author to the conclusion that there are only three basic methods of attack: oblique projection, auxiliary or tangent cones, and auxiliary or slicing planes. Each of these is described and discussed in turn in Part I, comprising the text proper, which also takes up elementary considerations in the theory of drawing and the various orders of architecture. Part II consists of problems for solution, grouped according to the divisions of Part I. The arrangement of the book is sufficiently flexible to make its use possible in study courses of various degrees of intensity. Its intelligent use requires familiarity with orthographic projection and at least an elementary knowledge of descriptive geometry.

Timely While Still in the Trough

FORECASTING BUSINESS CYCLES—By Warren M. Persons, Ph.D., Consulting Economist, New York; formerly Professor of Economics, Harvard University. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Ltd. Cloth; 6x9 in.; pp. 295; many tables and graphs. $4.50.

IN "Forecasting Business Cycles" Dr. Persons introduces his subject by a general discussion of the problems of such forecasting. He makes this realistic by reprinting a forecast published by him late in 1930, to the effect that the depression then current would begin to recede in a short time and would be over within a year or possibly a little more. He lets his foreword stand as written, with no "hindsight" revision. In justification of any failure in his forecast he points out that in any forecasting system one cannot do more than use all available pertinent normal data in the light of experience, leaving unforeseeable abnormal happenings in the hands of the gods of chance. Next the author presents in much detail a statistical and chronological record of business conditions in the United States since 1875, accompanied by monthly indexes and explanatory comments. The third and final part of the book is devoted to probability analysis, classified outlines of numerous theories of business fluctuation, in the language of their authors, and a chapter on "Statistics and Economic Theory."

Among the theories presented in Part III the author accepts as best representing his own view this statement by Dr. Arthur Spiethoff: "Ever since we have had capitalistic production on a large scale uninterrupted expansion of business has been lacking. Numerous exterior occurrences such as war, fluctuations in crops and population, epidemics, natural phenomena, changes in economic organization, gold production, etc., interrupt steady development. But there are endogenous causes of the *regular* undulations of business which spring from our economic institutions.

The book is not an attempt to show how to prevent business fluctuations but rather to provide ways and means for predicting them, a task which, difficult and uncertain as it still may be, is made easier and more certain by the rapid accumulation of pertinent statistics and their interpretation with the aid of probability or correlation methods. The statistical data presented for each of the great periodic fluctuations of the last half century and the author's monthly indexes are notable contributions to the literature of business and other cycles. The classified summaries of the causes of business fluctuations illustrate forcibly past and present differences of opinion and give readers a variety of choice if they do not see fit to accept Dr. Person's indorsement of Dr. Spiethoff's

theory. The book as a whole is a valuable contribution to a subject of broad concern to all—especially at a time when business has long been becalmed in a deep trough of depression.

Consolidation of New England Railroads

THE NEW ENGLAND RAILROADS: Recommendations for a Policy With Respect to Consolidation and Ownership—Report of the New England Railroad Committee to the Governors of the New England States. Paper; 6x9 in.; pp. 284 + appendixes. Those desiring the report should apply to the governor of one of the states at the corresponding state capital.

THE New England railroads are the subject of a report of a committee set up by the governors of the six New England States to recommend a policy with respect to railroad consolidation and ownership. Briefly, the committee recommends that the governors petition the Interstate Commerce Commission for the right to intervene in the four-system railroad consolidation plan; that the Boston & Maine and the New Haven railroads be freed from their present excess ownership of their stock by the Pennsylvania; and that if the four-system plan meets the commission's approval or if the commission approves a plan for consolidating the Boston & Maine and the New Haven, it be requested to impose in its order of approval a condition that no railroad, directly or indirectly, should acquire stock in the New England roads without the approval of the commission. The report recommends that the governors urge upon the New England members of Congress the support of legislation providing for regulation by the I.C.C. of the activities of holding companies in acquiring stocks of railroads. Reservations and a dissenting opinion are included in the report.

Manual for Map Draftsmen

MAP DRAFTING AND LETTERING—By Howard Raymond Saunders, Assistant Civil Engineer, City of Los Angeles, and Howard Chapin Ives, Consulting Engineer. Los Angeles: Benson Book Co., Inc., 426 South Spring St. Cloth; 6x9 in.; pp. 345; tables and illustrations. $5.

STEPS in the preparation of a map, from the selection, use and care of instruments and supplies to the methods used in quantity reproduction, are detailed meticulously in "Map Drafting and Lettering." The intention of the of the authors has been to produce a guide for the inexperienced beginner which is, at the same time, a useful reference work for the accomplished draftsman. Much of the text is based upon methods used by the U. S. Geological Survey, which is generally accepted as standard practice in this country. An appendix contains information on the functions of various governmental agencies engaged in mapping activities, lists the geographical positions of principal base lines and meridians in the United States and gives a number of mathematical tables pertaining to surveying and mapping.

Interstate Power

INTERSTATE TRANSMISSION OF ELECTRIC POWER: A Study in the Conflict of State and Federal Jurisdictions—By Hugh Langdon Elsbee, Instructor in Government, Harvard University. Cambridge, Mass.: Harvard University Press. Cloth, 5x8 in.; pp. 212. $2.50.

BASED on a review of court and public utility commission rulings on questions of interstate transmission of electric power, the author outlines the legal and administrative problems involved and recommends certain proposals for regulation. Tracing the history of U. S. supreme court decisions, a lack of established policy is found in handling this problem, particularly on the basic point regarding the natural-resource classification of hydro-electric power. Special attention is paid to the question of interstate contracts for wholesale power. Regulation of security issues by state commissions is shown to be weak under present conditions because of lack of jurisdiction over companies doing business in several states. State commissions, the author says, are "growing more and more hostile to federal intervention." The book brings to date the legal and administrative phases of this rapidly growing problem.

Vast Store of Waterworks Data

INDEX OF THE TRANSACTIONS AND JOURNAL of the New England Water Works Association, 1882 to 1930. Part II of *Journal* for March, 1931. Paper; 6x9 in.; pp. 45. $1.25 from New England Water Works Association, Tremont Temple, Boston, Mass.

THE vast store of information on waterworks design, construction, operation, financing and management laid before the New England Water Works Association since its formation in 1882 has been covered in three indexes—subject, author and affairs of the association. The latter includes biographical notices and portraits. The subject index does not extend to all the details brought out in a given paper but is quite comprehensive. Cross-references by main topics are freely used. The last previous general index to the *Journal* having been published fifteen years ago, the new index should have a hearty welcome and wide use.

Publications Received

THE NATIONAL PARKS of the United States, how to get to them and through them, what to see, camping and hotel facilities and a variety of related information are described in a series of pamphlets, obtainable from the National Park Service, Washington, D. C. Besides handsome views the pamphlets contain useful maps, some of which show railways and automobile routes to the various parks.

IRRIGATION MAPS in atlas form covering the drainage basin of the River Po are being published by the minister of public works of Italy, under the direct charge of Ufficio Idografico del Po, Parma, Italy. Three atlases recently issued cover the regions Emiliaria, Lombardy and Piemontesei. Each atlas is 11x16 in., bound in heavy cardboard. The principal maps are on a scale of 1 : 100,000, are in colors, and show canals taking water from rivers, from springs and from wells, and also the districts supplied. Preceding the maps are a few pages of descriptive text accompanied by tables of data for each main canal. The atlases are handsomely made and promise to be as useful as handsome.

JOURNAL OF CALENDAR REFORM makes its first appearance this June. It is published by the World Calendar Association, 485 Madison Ave., New York City, which is promoting a modified twelve-month year in contrast to the thirteen-month proposal, said to be the only serious one of many rival plans. The twelve-month plan would have January and July of each year begin on Sunday and would so rearrange some of the present 30- and 31-day months as to make four quarter-years of thirteen weeks, each with thirteen Sundays. The left-over 365th day would be known as "the second Saturday Dec. 30," and in like manner the 366th day in leap years would be "the second Saturday June 30." Among the articles in the first issue of *Calendar Reform* is one by Col. Ernest McCullough, M.Am.Soc.C.E., "author of many books on engineering subjects." Apparently membership in the association is free and with it issues of its journal.

PRESERVATION AND IMPROVEMENT of Niagara Falls and Rapids, with particular relation to their scenic beauty is the subject of a report of the Special International Niagara Board. It includes an exhaustive study of the flow of the Niagara River, the recession of the falls, extent and character of the present diversion for power purposes and the possibility of further diversion without detrimental effect through the construction of control works

above the falls. The report is profusely illustrated with halftone engravings and line cuts and contains many tables and charts showing the flow conditions at the falls. The board recommends that the two governments agree to the immediate construction of the initial remedial works proposed in the report and that upon the completion of the works a limited amount of additional diversion be permitted at certain times and under certain conditions in order to determine whether permanent diversion should be authorized. The board further recommends that the construction of remedial works be under the direct supervision of the Permanent International Niagara Board of Control appointed by the two governments in 1923. (Paper covers; 9x12 in.; 355 pp. $1.50 from Superintendent of Documents, Washington, D. C.)

New Books and Revised Editions

[Those desiring copies of the books listed below or mentioned elsewhere in this section should order them from the publishers or from their local booksellers.]

AMERICAN PUBLIC HEALTH ASSOCIATION YEAR BOOK, 1930-31—370 Fifth Ave., New York City. Paper; 7x10 in.; pp. 320. $3.

The first Year Book published by the A.P.H.A. in its 60 years of existence, and the first complete list of membership issued since 1927. Contains all committee reports for the year in full; heretofore published in the *Journal*, sometimes in abstract.

AUSGEWÄHLTE SCHWEISSKONSTRUKTIONEN, Band 2: Maschinenbau—Von Dr. Ing. Karl Haas. Gesammelt und Herausgegeben vom Fachausschuss für Schweisstechnik im Verein Deutscher Ingenieure und von der Deutschen Gesellschaft für Elektroschweissung. Berlin, N. W. 7: V.D.I.—Verlag GMBH. Cloth; metal back; pp. XII + 97 plates. 13 marks.

Pictorial representation of welding as applied to machinery fabrication much as Vol. I was devoted to structural welding. The first report, written by Dipl.-Ing. Otto Bondy, was noted in our issue of Sept. 18, 1930, p. 466.

BERECHNUNGSGRUNDLAGEN UND KONSTRUKTIVE AUSBILDUNG von Einlaufspirale und Turbinensaugrohr bei Niederdruckanlagen—Von Dr. Herbert Rohde. Berlin: Julius Springer. Paper; 7x10 in.; pp. 112; illustrated. 11 marks.

BIOLOGY IN HUMAN AFFAIRS—By Hugh S. Cumming, M.D., Surgeon-General, U. S. Public Health Service; Morris Fishbein, M.D., Editor, *Journal* American Medical Association, and ten others. Edited by Edward M. East, Ph.D., Professor of Genetics, Harvard University. New York: Whittlesey House, McGraw-Hill Book Co. Cloth; 6x9 in.; pp. 399. $3.50.

DICTIONARY OF WELDING TERMS: English, German, Russian. Berlin N.W.7: VDI-Verlag GMBH. Paper; 4x6 in.; pp. 31. 2 marks.

DURABILITY AND STRENGTH OF BOND BETWEEN MORTAR AND BRICK—By L. A. Palmer and J. V. Hall, Research Associates for the American Brick Association. Reprint from Bureau of Standards *Journal of Research*, March, 1931. Paper; 6x9 in.; pp. 30; illustrated. 10c. from Superintendent of Documents, Washington, D. C.

MANUAL OF STREET SANITATION RECORDS for Cities of 10,000 to 50,000 Population as Installed at Brunswick, Ga. Chicago: Committee on Uniform Street Sanitation Records, 923 East 60th St. Paper; 8x11 in.; pp. 55; sample forms for records.

First of a series of five manuals designed to show application of standard street sanitation records to cities of various sizes. The other manuals will deal with larger cities: Kenosha, Wis., Troy, N. Y., installations in progress, and two still larger cities not yet designated.

NEW JERSEY MEADOW RECLAMATION COMMISSION: Report to the 1930 Legislature; Chairman, Joseph G. Wolber, State Senator, Montclair, N. J. Consulting Engineer, Morris R. Sherrerd, City Hall, Newark, N. J. Paper; 10x13 in.; pp. 76; folding maps in pocket.

Supplements a report to the New Jersey state legislature in 1929; presents a plan for zoning the entire meadows area around Newark Bay and the lower end of the Hackensack and Passaic rivers; outlines methods of carrying forward the work at a minimum cost to the state, and urges setting up some effective zoning regulations at the earliest possible date. A complete trunk highway system for the meadows area, expanding the existing state highway system, is included.

THE NEW INTERNATIONAL YEAR BOOK: A Compendium of the World's Progress, 1930—Editor, H. T. Wade. New York: Dodd, Mead & Co. Cloth; 7x10 in.; pp. 824; halftone plates. $6.75.

Engineering and allied topics and their contributors are: Automobiles, Henry R. Conleigh, M.E., member of staff, National Automobile Chamber of Commerce; Civil Engineering, J. K. Finch, C.E., professor of civil engineering, Columbia University; Metallurgy, E. H. Robie, associate editor, *Engineering and Mining Journal*; Power Engineering, Power Plants, etc., A. D. Blake, M.E., managing editor of *Power*; Railways, W. E. Hooper, former financial editor, *Railway Age*; Sanitary Engineering and Municipal Subjects, M. N. Baker, Ph.B., C.E., associate editor, *Engineering News-Record*.

PLANNING THE OUTDOOR SWIMMING POOL—By Lindon J. Murphy, Municipal Engineer, Engineering Extension Service, Iowa State College, Ames, Iowa. Paper; 6x9 in.; pp. 39; illustrated.

PUBLIC WATER SUPPLIES IN VIRGINIA—Division of Sanitary Engineering [Richard Messer, chief], State Department of Health. Reprint from annual report, 1929-30. Paper; 6x9 in.; pp. 48; tables; four halftones and one diagram. Richmond, Va.: State Department of Health.

Reviews history of water treatment in Virginia, describes each plant and lists supplies not treated; contains tabular summaries of methods of treatment and sources of supply.

SURVEYING MANUAL: Designed for the Use of First-Year Students in Surveying and Especially for the Use of Non-Civil Engineering Students—By Howard Chapin Ives, Civil and Consulting Engineer. Second Edition. Flexible; 4½x7 in.; pp. 296; line cuts, halftones and tables. $2.25.

In this edition a few pages of Polaris tables cover the years 1926-35 instead of 1915-28 and are differently arranged. Other changes have been made to bring the book to date.

TAXATION OF PRIVATE AND COMMON-CARRIER MOTOR VEHICLES BY MUNICIPALITIES—By James W. Martin, Director, and C. M. Stephenson, Assistant, Bureau of Business Research, University of Kentucky. New York: Municipal Administration Service, 261 Broadway. Paper; 8x11 in.; pp. 12. 15c.

Statistical study based on data for 1928 from "representative" cities of 10,000 and more in eight states and smaller places in two of the states in which motor vehicle taxes were collected.

ZONING IN THE UNITED STATES [A Symposium]—Edited by W. L. Pollard, Attorney at Law. May issue of *The Annals* of the American Academy of Political and Social Science, Philadelphia. Cloth; 6x9 in.; pp. 230; line cuts. $1.

Twenty-seven short papers by authors chosen from various parts of the United States, grouped under Historical and Legal, Procedure, Economics and General. Among the many well-known authors are W. M. Bassett, F. A. Delano, Harland Bartholomew, Robert Whitten, D. M. Baker, W. W. Horner, E. P. Goodrich, J. L. Crane and W. B. Munro. A short bibliography and indexes to subjects and names close the volume.

Letters to the Editor

Subaqueous Rock Drills

Sir—C. H. Vivian's interesting article on the "Development of the Rock Drill" in your April 9 issue indicates that great strides have been made in the speed of tunnel and quarry drilling in the last three decades.

It is realized that this article was intended to deal with the rock drill as used on dry work only. It would be interesting if Mr. Vivian or some other authority on rock drilling would write an article covering the improvements of the rock drill for subaqueous drilling during the same period of time. There seems to be very little authentic data available regarding the operation and performance of the subaqueous rock drill during the last twenty years. Both the first cost of subaqueous rock-drill equipment and the operating difficulties are much greater than for dry-land work. Therefore a review of the improvements on the subaqueous rock drill and drill boats, as used for drilling and blasting rock in the harbors of the United States and elsewhere in the world, would be, it is thought, of considerable interest to readers of this periodical connected with subaqueous rock removal.

O. P. Erickson,
Engineer,
Great Lakes Dredge & Dock Co.

Chicago, Ill.,
April 20, 1931.

Roller Trains for Stoney Gates

Sir—The article on "Gate Handling at Calderwood Dam," in the May 7 issue is of unusual interest to the dam designer. The ingeniously designed grappling beam and the novel roller-train control are a step forward in cutting down operating and maintenance costs. The Aluminum Company of America should be complimented for its numerous contributions to hydro-electric engineering.

There seem to be several disadvantages to the rack-and-pinion roller train that would tend to limit its field of application. In the event of broken teeth on either stationary or traveling gear racks it would mean a major operation of repairs; whereas the usual cable-controlled roller train has little to go wrong except the cables, which are easily replaced in a short time without removing the gate. There is also the possibility of ice forming upon the racks and pinion, causing trouble. It would be interesting to know if the ice hazard was responsible for the use of the usual cable-type roller train rather than the rack-and-pinion type of roller train for the stoney gates at Chute-à-Caron, the most recent Aluminum Company of America power development.

L. M. Davis.

Holtwood, Pa.,
May 22, 1931.

NEWS OF THE WEEK

Sawyer Heads Federal Employment Stabilization Board

D. H. Sawyer, of New York City, has been appointed director of the Federal Employment Stabilization Board. This board, authorized by the last Congress in one of the bills introduced by Senator Wagner, of New York, is to take up advance planning of federal construction in all its branches, in order to help take care of unemployment. One of its objects is a study of the ups and downs of building operations. The other members of the board, besides Mr. Sawyer, are the secretaries of the treasury, agriculture, labor and commerce.

For several years Mr. Sawyer was chief engineer of the Illinois Traction System. Later he became a member of Sawyer Bros., consulting engineers, with offices in Seattle and Spokane. When the United States entered the World War, Mr. Sawyer joined the construction division of the war department, being commissioned a colonel. Camp Grant and Camp Bragg were constructed under his direction, as was the nitrate plant at Cincinnati. In 1923 he became secretary of the Associated General Contractors of America, holding that office until 1929.

The nucleus of the new board will be the temporary organization in the division of housing, department of commerce, which has been under the direction of John M. Gries.

New Rush-Hour Traffic Plan in Effect in San Francisco

A new rush-hour traffic plan aimed to flatten out the evening peak was put into effect in San Francisco on June 15. The working hours of 10,000 employees of 96 San Francisco non-retail business establishments are advanced half an hour, making a 4:30 closing hour. There are 20,000 non-retail employees in the city and it is hoped the remaining 50 per cent will gradually fall in line with the new plan. This is the first actual operation of such a traffic plan based on a comprehensive survey of existing traffic problems and their solution. Experiments along this line were tried in New York and also in Washington, D. C., during war time.

Minneapolis Votes Funds for Sewage-Disposal Plant

At a city election in Minneapolis on June 8 an amendment to the charter was passed, 81,111 to 25,538, providing for an annual tax for ten years of 2½ mills to finance a sewage-disposal system, with a 1-mill tax thereafter for operation. The amendment permits the city to proceed with the construction of its own sewage-disposal system rather than under a regional commission, as was proposed in a bill passed by the legislature but vetoed by the governor. Under the regional plan sewage from St. Paul and South St. Paul, as well as from Minneapolis, would be treated.

At the same election the citizens also chose a labor mayor, committed to force-account construction and pledged to undertake extensive public works.

Hundred Million Dollar Iowa Road Bond Issue Invalid

State supreme court for second time declares illegal plans of legislature for refinancing primary road system—Further attempts will probably be abandoned

A DECISION of the Iowa supreme court has declared invalid the constitutional amendment providing for an issue of $100,000,000 of state bonds for refunding county bonds issued to build primary or state-system roads. This is the second decision of this court adverse to the action of the state legislature. The course of legislative action and the court decisions which have twice declared it illegal have been briefly summarized for *Engineering News-Record* as follows by F. R. White, chief engineer, Iowa state highway commission:

1. In March, 1928, the legislature passed a state bond act authorizing $100,000,000 of state road bonds.

2. This bill was adopted by the people of the state at the November election in 1928 by a vote of two to one.

3. The state supreme court, on March 5, 1929, held this state bond bill to be invalid and unconstitutional.

4. The bond bill was held unconstitutional principally for the following reasons: (*a*) The bill sought to pledge motor license fees and gas tax funds for the payment of such bonds and interest. The court held that this could not be done under the constitution. (*b*) The bill purported to levy a property tax with which to pay the interest and principal of the state bonds in case the motor license fee and gas tax funds were not sufficient therefor. The court held that the bill would not actually levy a tax.

5. Subsequent to March 5, 1929, when the state bond act was held invalid, the legislature, then in session, adopted a proposed amendment to the constitution of the state empowering the legislature, without further vote of the people, to authorize the issue of $100,000,000 of state road bonds and specifically providing that the motor license fees and gas tax funds could be used in the payment of interest and principal of these state bonds.

6. This proposed constitutional amendment was again adopted by the general assembly in February, 1931, and June 16, 1931, was fixed as the date for submitting it to the vote of the people.

7. An action was started in March, 1931, to test the validity of this proposed constitutional amendment. The Iowa supreme court, early in May, held the amendment invalid.

8. The court held the amendment invalid because, according to the court, the amendment contained two subject matters: (*a*) It authorized the issuance of $100,000,000 of state primary road bonds, and (*b*) it stopped the issuance of county primary road bonds.

9. During the years that the state has been endeavoring to get a state road bond issue adopted, it has gone forward with its road improvement using county primary road bonds (that is, bonds voted by the counties for the improvement of primary or state roads) until by the end of this year it will have approximately $100,000,000 of county primary road bonds outstanding.

10. The proposed constitutional amendment recently held invalid by the court required that county primary road bonds be refunded out of the proceeds of the state bond issue. Therefore the state bond issue had become nothing but a refunding plan for the refunding of county primary road bond indebtedness into a state indebtedness.

11. The defeat of the state bond constitutional amendment should have no detrimental effect on the progress of the state roadbuilding program.

In considering the fact that the Iowa supreme court has on two occasions within the past two years held invalid the proposed state bond issue of $100,000,000, one may have in mind the question, "Why did the good roads forces in Iowa not employ legal talent to make sure beforehand that this proposed state bond bill, and later this proposed constitutional amendment, were valid and would meet the court's scrutiny?"

The answer is that they did. It would be a long story to tell all of the

(Continued on page 1026)

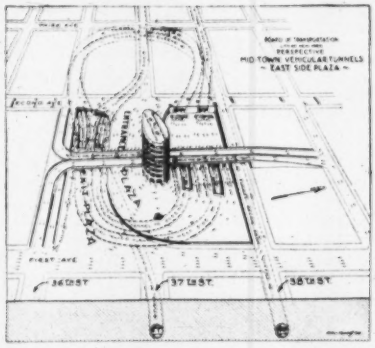
New Plans Submitted for Crosstown-East River Tunnel at New York

REVISED preliminary plans and an estimate of the cost and probable income from a crosstown vehicle tunnel under Manhattan Island and a tunnel under the East River to the boroughs of Queens and Brooklyn have been submitted to the board of estimate and apportionment of New York City by the city's board of transportation. The cost of the entire project, including real estate, exit and entrance plazas and ventilation, is placed at $93,000,000. To this amount 6 per cent has to be added for engineering and 10 per cent for interest during construction, thus raising the total cost to nearly $108,000,000.

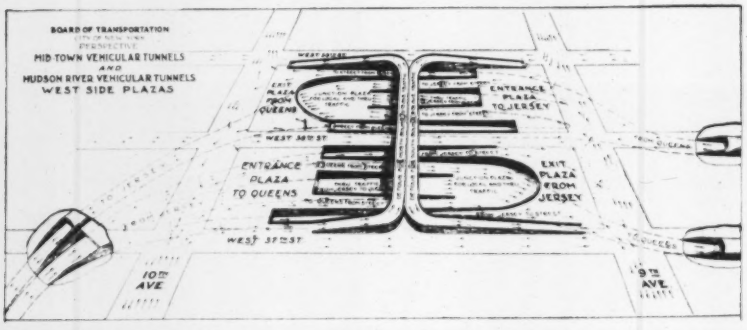
The project as now laid out includes a great plaza at the west side of Manhattan Island between Ninth and Tenth Aves. which will serve jointly as an exit and entrance plaza for the projected 38th St. tunnels under the Hudson River and for the crosstown tunnels, a pair of two-lane tunnels from this plaza extending eastward under 37th and 38th Sts., a plaza on the east side of the island between First and Second Aves. for the integration of the traffic to and from the crosstown tunnel with that to and from tunnels under the East River, a pair of shield-driven two-lane tunnels under the East River to Long Island City, a plaza there and a pair of tunnels under Newtown Creek to Brooklyn. The exact location of the West Side plaza will depend upon the location of the Hudson River tunnels approved by the legislatures of the two states this spring (*ENR*, Mar. 5, 1931, p. 409). Plans for the latter tunnels are well along, but their location has been fixed only tentatively.

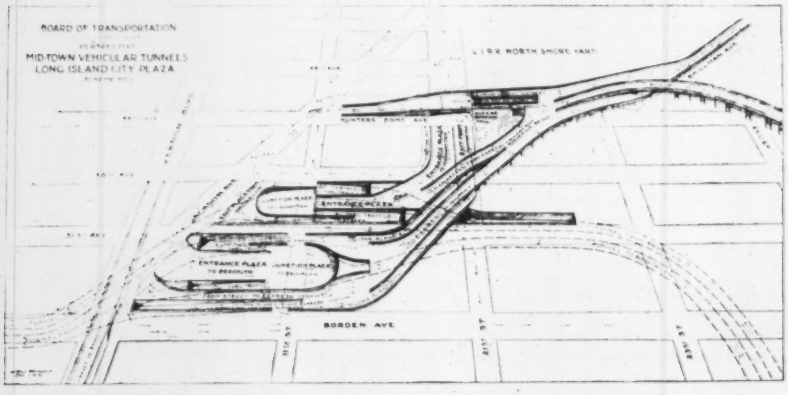
Both the crosstown tunnels and the East River tunnels are proposed to be toll highways. The present bridges over the East River are free; therefore the proposed tunnels will have to offer greatly increased speed from origin to destination in order to attract traffic from the congested bridge crossings. The same is true of the crosstown tunnels. For this reason very elaborate entrance and exit plazas have been laid out in an attempt to insure fast continuous movements.

Through traffic from the river tunnels to the crosstown tunnels will be brought to the surface and turned through a complete loop to integrate it with traffic from the streets. This has been done to eliminate cross-movements below ground in the tunnels. The time saved by this provision for continuous movement is estimated to be more than sufficient to offset the added distance traveled.



Intermediate plaza at east side of Manhattan





Plazas for extremities of proposed vehicle tunnel at New York

Traffic surveys prepared by Day & Zimmermann, Inc., in a report to the city made in October, 1929, have been analyzed by the board of transportation in an attempt to estimate the probable earnings from the two pairs of tubes, but the board states that it is difficult to draw any conclusions from its studies because of the great uncertainty as to what traffic will use the toll facilities in preference to the free but congested facilities now available.

Divided into subsections the cost of the project is as follows:

	Length, Ft.	Cost
Two-lane tunnels under East River (shaft to shaft)	3,790	$22,000,000
East Side plaza	1,610	27,700,000
Two-lane crosstown tunnel, Third to Ninth Ave.	5,860	14,800,000
West Side plaza	800	4,100,000
Queens end of tunnel	2,400	10,550,000
Plaza in Queens and connections to Brooklyn	4,260	14,450,000
	18,720	$93,600,000

These figures do not include engineering (6 per cent) and interest during construction (10 per cent).

The East Side plaza would require considerably less area if used for the East River tunnels alone. Provision for integrating that traffic with the crosstown tunnel traffic adds materially to the area required. The cost of the crosstown tunnels with incidental plazas is placed at $31,000,000, and of the East River tunnel, with independent plazas, at $62,600,000.

The board recommends that the East River tunnels be of cast-iron tubes having an outside diameter of 31 ft., as against 29 ft. 6 in. used for the Holland Tunnel. The saving in ventilating costs due to reduced pumping is estimated to more than offset the greater cost of the larger tube. Also, the larger tube would permit a 21-ft. roadway width. The Holland Tunnel roadway is 20 ft. wide.

Iowa Road Bond Issue Invalid

(Continued from page 1025)

steps that were taken to insure the validity of this measure. Outstanding lawyers of the state were brought together in an effort to make sure that the proposed measures would be held valid, and these were submitted to noted bond attorneys of the Middle West and were, by them, held valid. In spite of all that, the court held otherwise.

So far as the state roadbuilding program itself is concerned, it has passed the point where a state bond issue is needed. The state has financed the roadbuilding program out of county bond issues as a temporary financial plan, with the expectation that the county bonds would be taken up and refunded by the state bond issue.

Now that the plan has run into all of these difficulties and the supreme court has twice knocked it out, it is doubtful if a state bond issue will again be attempted.

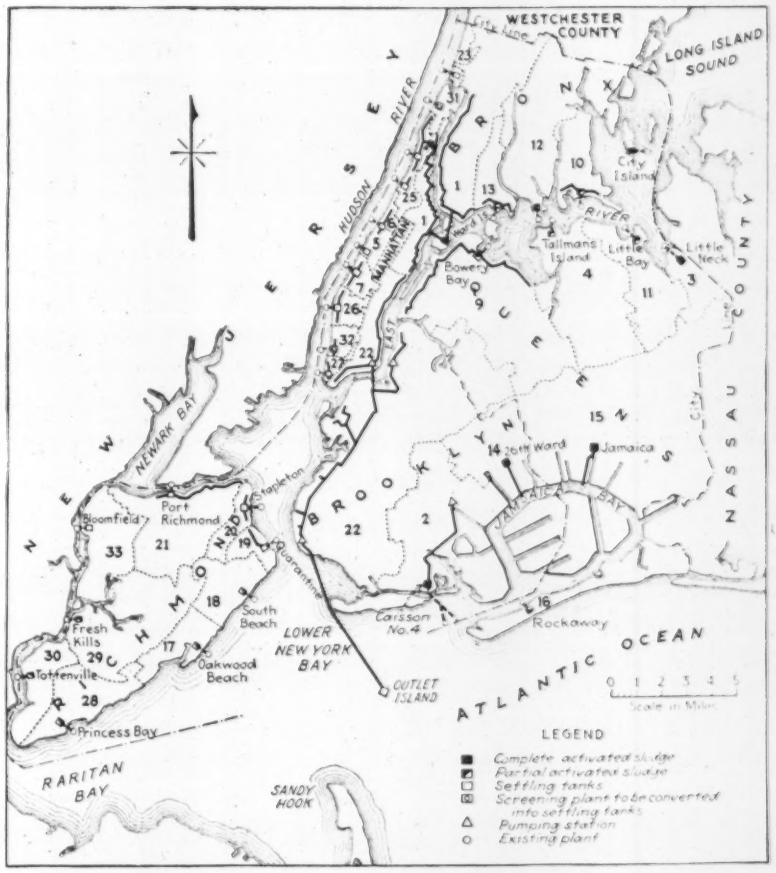
Height of Proposed Pine Canyon Dam Reduced 50 Ft.

The California state engineer has approved the amended application made by the city of Pasadena reducing the height of the proposed Pine Canyon dam 50 ft. The original application, which was granted by the state division of water rights, called for a 295-ft. dam that would store 64,000 acre-ft.; the amended application provides for a 240-ft. dam to store 40,000 acre-ft. of water.

The estimated cost of the dam, exclusive of conduits and other features of the project, is given by the city as $5,770,000.

Three Plans for Treatment of New York's Sewage Submitted

Publication of a report on sewage disposal for the city of New York prepared some time ago by the department of sanitation reveals details of a 30-year program for the treatment of all city sewage to be discharged into New York harbor and tributary waters. Three plans are submitted, all covering the entire city but differing in the degree of treatment proposed. Plan B provides for the most complete treatment that now appears practicable; plan C for a low degree of treatment, and plan A, which is recommended by the department for adoption, for reasonably complete treatment intermediate between the other two. General characteristics of the three proposals are shown in the following table:



Location of proposed sewage-treatment plants in New York City

	Plan A	Plan B	Plan C
Degree of purification, per cent*	79.1	92.4	56.0
Population load untreated*	3,066,000	1,113,000	6,460,000
Reproducing conditions as of	1905	1893	1925
Total cost	$243,560,000	$377,935,000	$158,775,000
Cost per capita of equivalent population	$16.59	$25.75	$10.82
Cost per m.g.d. average flow	$115,050	$178,525	$75,000
Cost per capita removed	$20.98	$27.87	$19.33

*The purification effected in removal of biochemical oxygen demand is indicated in terms of equivalent population. Under plan A, for example, plant capacity would provide for an equivalent population of 14,675,000, leaving an equivalent of 3,066,000 untreated and giving a purification factor of 79.1 per cent.

Calculations are based upon population estimates for 1960, with an allowance for non-residential load. Costs are approximate, and are intended to include land and engineering. The need for cooperation by near-by sections of Westchester County and New Jersey in any comprehensive attempt to improve

	Tentative Plan "A"					Tentative Plan "B"					Tentative Plan "C"				
Project No.	Type of Plant	Aver. Flow, M.G.D.	Equivalent Population Treated	Equivalent Population Not Treated	Cost	Type of Plant	Aver. Flow, M.G.D.	Equivalent Population Treated	Equivalent Population Not Treated	Cost	Type of Plant	Aver. Flow, M.G.D.	Equivalent Population Treated	Equivalent Population Not Treated	Cost
1	As	311	2,006,000	200,600	$45,000,000	As	311	2,006,000	200,600	$45,000,000	Pas	311	2,006,000	410,200	$37,000,000
2	As	140	1,300,000	65,000	22,600,000	As	140	1,300,000	65,000	22,600,000	Sed	140	1,300,000	520,000	10,700,000
3	As	11	80,000	8,000	1,500,000	As	11	80,000	8,000	1,500,000	As	11	80,000	8,000	1,500,000
4	Pas	93	713,000	178,250	9,300,000	As	93	713,000	71,300	11,400,000	Sed	93	713,000	356,500	4,000,000
5	Sed	25	134,000	80,400	1,325,000						Sed	25	134,000	80,400	1,325,000
6	Sed	20	133,000	79,800	1,182,000	Combined with project 22					Sed	20	133,000	79,800	1,182,000
7	Sed	39	260,000	156,000	2,900,000						Sed	39	260,000	156,000	2,900,000
8	As	1	10,000	1,000	150,000	As	1	10,000	1,000	150,000	Sed	1	10,000	5,000	85,000
9	Pas	80	562,000	140,500	12,400,000	As	80	562,000	56,200	14,900,000	Sed	80	562,000	281,000	8,000,000
10	Pas	15	75,000	18,750	2,500,000	As	15	75,000	7,500	2,950,000	Sed	15	75,000	37,500	1,860,000
11	Pas	40	290,000	72,500	4,600,000	As	40	290,000	29,000	5,800,000	Sed	40	290,000	145,000	1,850,000
12	Pas	73	460,000	115,000	7,000,000	As	73	460,000	46,000	9,600,000	Sed	73	460,000	230,000	4,000,000
13	Pas	68	465,000	116,250	7,050,000	As	68	465,000	47,000	9,215,000	Sed	68	465,000	232,500	3,535,000
14	As	72	567,000	56,700	8,300,000	As	72	567,000	56,700	8,300,000	As	72	567,000	56,700	8,300,000
15	As	177	1,275,000	127,500	20,400,000	As	177	1,275,000	127,500	20,400,000	As	177	1,275,000	127,500	20,400,000
16	Pas	18	166,000	33,200	2,000,000	As	18	166,000	8,000	2,630,000	Sed	18	166,000	83,000	830,000
17	Pas	10	53,000	10,600	1,000,000	As	10	53,000	5,300	1,300,000	Sed	10	53,000	26,500	500,000
18	Pas	18	118,000	23,600	1,800,000	As	18	118,000	11,800	2,340,000	Sed	18	118,000	59,000	880,000
19	Sed	8	61,000	30,500	380,000						Sed	8	61,000	30,500	380,000
20	Sed	13	92,000	46,000	570,000	Combined with project 33					Sed	13	92,000	46,000	570,000
21	Sed	55	408,000	244,800	3,100,000						Sed	55	408,000	244,800	3,100,000
22	Sed	577	3,840,000	384,000	72,600,000	Pas	847	5,606,000	286,000	193,600,000	Sed	577	3,840,000	2,300,000	33,100,000
23	Sed	5	35,000	21,000	200,000						Sed	5	35,000	21,000	200,000
24	Sed	15	97,000	58,200	1,350,000						Sed	15	97,000	58,200	1,350,000
25	Sed	36	240,000	144,000	1,815,000	Combined with project 22					Sed	36	240,000	144,000	1,815,000
26	Sed	45	296,000	177,600	2,883,000						Sed	45	296,000	177,600	2,883,000
27	Sed	12	81,000	48,600	735,000						Sed	12	81,000	48,600	735,000
28	Pas	16	87,000	17,400	1,800,000	As	16	87,000	4,400	2,280,000	Sed	16	87,000	43,500	680,000
29	Pas	17	85,000	21,250	2,000,000	As	17	85,000	8,500	2,340,000	Sed	17	85,000	51,000	695,000
30	Pas	10	56,000	11,200	1,200,000	As	10	56,000	2,800	1,400,000	Sed	10	56,000	30,800	500,000
31	Sed	35	235,000	141,000	1,400,000						Sed	35	235,000	141,000	1,400,000
32	Sed	38	255,000	153,000	1,570,000	Combined with project 22					Sed	38	255,000	153,000	1,570,000
33	Sed	24	140,000	84,000	950,000	As	100	701,000	70,100	20,230,000	Sed	24	140,000	84,000	950,000
		2,117	14,575,000	3,066,000	$243,560,000		2,117	14,675,000	1,112,700	$377,935,000		2,117	14,675,000	6,459,600	$158,775,000

As = Activated sludge. Pas = Partial activated sludge. Sed = Sedimentation.

sanitary conditions in the harbor is stressed in the report: the 1960 equivalent population load on the harbor from sources outside of the city is estimated at 3,010,000. Because the plan recommended is based largely upon data secured by previous investigators, notably the Metropolitan Sewerage Commission, the report points out that many revisions in detail will undoubtedly be necessary in the light of subsequent information and also because of probable improvements in the art of sewage treatment. The primary object of the report is to develop a policy and a permanent plan for guidance, rather than to present a detailed construction program.

A list of the proposed plants in the three plans, in the order of construction recommended by the department, is given in the large table. The numbers refer to collection districts outlined on the map.

Domestic Cement Mills Ask Higher Import Tariff

As might be expected, there is wide conflict in the testimony of domestic manufacturers and the importers of cement concerning the effect of the duty of 22.8c. per barrel imposed by the 1930 tariff. Their rival claims were presented June 10-11 at a hearing before the tariff commission in response to the Senate resolution sponsored by Senator Borah. Cement is one of the few important commodities which the reorganized tariff commission has taken up for investigation with a view to determining whether an adjustment in duty is warranted.

Claiming that Belgian cement has disrupted the seaboard markets, the representatives of Alpha, Lawrence, Lehigh and other domestic mills declared that the present duty is totally inadequate and that it should be increased to 36c., the maximum permissible under the flexible tariff provision for a 50 per cent adjustment in tariff duties either way. Albert MacC. Barnes, counsel for the domestic producers, informed the commission that the domestic industry does not complain concerning the volume of imports, but contends that it is not a healthy condition when imports so materially affect the domestic price situation. The weighted average cost of domestic cement delivered at principal markets, said Mr. Barnes, is $1.98, compared with $1.47 for imported cement.

Importers of Belgian cement claimed that as a result of the 1930 tariff their business had been cut in half. L. P. E. Giffroy, representing fourteen Belgian cement mills, testified that the capitalization cost per barrel of cement in Belgium is $1.70, while the cost in the larger domestic mills ranges from $2.10 to $2.50. In no one year of the last ten, said Mr. Giffroy, have imports represented more than 2 per cent of domestic consumption, and imports in 1930 would have dropped lower than the actual figure of one-half of 1 per cent had not unexpired contracts been completed, regardless of the increased duty that has been imposed.

COSTS AND CONTRACTS

ENR Index Numbers

Cost			Volume		
June 1, 1931	187.23	May,	1931	251
May 1, 1931	189.33	April,	1931	289
June 1, 1930	203.36	May,	1930	354
Average, 1930	202.85	Average,	1930	260
Average, 1929	207.02	Average,	1929	317
1913	100.00	1913		100

This Week's Contracts

Heavy construction contracts, reported by *Engineering News-Record* in the week of June 18, with some comparisons, total as follows:

(In Thousands of Dollars)

	June 18, 1931	Average of Last Four Weeks 1931	Average of Last Four Weeks 1930
Buildings:			
Industrial	$1,474	$2,645	$6,556
Other	15,632	15,875	23,825
Streets and roads..	16,862	13,087	17,634
Other eng. constr.	22,590	16,239	29,434
Total	$56,558	$47,847	$77,450
Total, all classes, Jan. 1 to June 18:			
1931			$1,349,354
1930			1,779,256

Feasibility of Subway in San Francisco Studied

A survey requested by the board of supervisors to determine the feasibility of a subway under Market St., San Francisco, from Valencia St. to Battery St., has been completed by M. M. O'Shaughnessy, city engineer. The report recommends a 2-mile subway on Market St., 1 mile of four-track and 1 mile of two-track. In addition there will be two two-track branches aggregating 1 mile. Double surface tracks will be maintained on Market St. to take care of the short-haul and permit loading at each intersection.

A report will be printed in the near future to be used by city and utility officials and civic bodies in studying this project.

Scales and Real Wages in 54 Cities

Data on nominal and actual wages in nine cities are added this week to the data already presented for 45 cities in the June 4 and 11 issues, pp. 946 and 990. The additional data make some slight revision in the summary figures. The per cent that actual wages are below scale is as follows: carpenters, 20; bricklayers, 19; plasterers, 18; ironworkers, 17; common laborers, 26; average of the five trades, 20 per cent.

Oswego, N. Y., contractors are paying scale, but look for wage cut. Wages at Toledo are considerably below scale, and some common labor is being hired at 28c.; for city and county work, 50c.; general level, 30c. Further decreases of 10 to 30 per cent are predicted. Low wages are paid also at Cincinnati.

Construction employment at Detroit is 30 per cent normal, but except for a few so-called illegitimate contractors official rates are being maintained. City committee on employment is placing men at these rates.

The "actual" wages given for Tulsa apply only on residential and small commercial building, as the scale is being paid on large projects. Other reductions are not expected this year.

Wages have broken severely in the Far West. At Salt Lake City the break amounts to 12 to 34 per cent, and skilled mechanics are accepting jobs at the price offered. The plasterers' rate is $12, but on the new high school $10 is being paid. Common labor is as low as $3. At Portland, Ore., the actual rate for all trades is given as 50c. per hour, and men are accepting whatever work is offered. The largest sawmill on the coast is working six-hour shifts, employs only its old hands, and pays 37½c. The Seattle chapter of the A.G.C. recently signed a three-year agreement with the local unions, and this is being observed on big work. There is some sniping by the smaller contractors, the pay going as low as 87½c. for carpenters, 75c. for bricklayers and 50c. for common labor.

In northern and central California data on actual wages are difficult to obtain at this time. Contractors and subcontractors report cutting by competitors, but refuse to give the figures. Large contractors in San Francisco and in Alameda County pay the scale of the impartial wage board of the San Francisco industrial association. This association is checking wages on all projects under way or about to be started. The unions, it is understood, allow men to accept any employment.

OFFICIAL AND ACTUAL WAGES OF BUILDING MECHANICS IN 9 CITIES

	Carpenter		Bricklayer		Plasterer		Ironworker		Common Labor	
	Scale	Paid	Scale	Paid	Scale	Paid	Scale	Paid	Scale	Paid
Tallahassee	.....	$0.30@$0.60	.....	$0.40@$0.70	.....	$0.40@$0.70	.....	.....	.....	$0.25
Oswego	$1.00	1.00	$1.50	1.50	$1.50	1.50	$1.25	$1.25	$0.50	$0.50
Toledo	1.00	0.75@0.80	1.50	1.00	1.50	1.00	1.50	1.25@1.50	0.50	0.30@0.40
Cincinnati	1.40	0.50@1	1.62½	0.90@1.25	1.62½	0.90@1.25	1.40	1.00	0.60	0.25@0.40
Detroit	0.80@1	0.80@1	1.25@1.50	1.25@1.50	1.37½	1.37½	1@1.25	1@1.25	0.50	0.35@0.50
Tulsa	1.25	0.75@1.10	1.68½	1@1.25	1.37½	0.90@1.10	1.25	0.90@1	.....	0.35@0.40
Salt Lake	1.12½	0.62½@0.87½	1.37½	0.87½@1.12½	1.50	1@1.25	1.25	0.75@1	0.62½	0.40@0.50
Portland, Ore	1.12½	0.50	1.50	0.50	1.50	0.50	1.37½	0.50	0.75	0.50
Seattle	1.12½	1.12½	1.50	1.50	1.50	1.50	1.12½@1.25	1.12½@1.25	0.70	0.70
Average 54 cities	1.14	0.91	1.54	1.24	1.47	1.20	1.31	1.09	0.58	0.43
		20%		19%		18%		17%		26%

Hoover Dam Notes

Progress of work on the Boulder Dam project for the week ended June 10 included the following:

Limestone available at Sloan has been investigated and found to be entirely suitable for use in concrete for paving purposes in Boulder City. A concrete testing laboratory has been set up in the basement of the Custom House building in Denver. Work on models of spillways at Fort Collins and on the south canal at the Uncompahgre project was continued.

The power line from Victorville to Riverside will be ready for testing June 25. The adit in the Arizona abutment had penetrated to a depth of 385 ft. on June 6. The Nevada abutment adit was in 187 ft. on that date and is being pushed forward by three shifts of men. Preparations began during the week for the opening of work on the Arizona tunnel headings.

Foundations for the power substation at Boulder City have been completed. Holes for poles are being dug through the rock section. Advertisements for poles, crossarms and line hardware have been issued. Final designs are ready for the transmission line from Hoover Dam to Boulder City. Designs for the distribution system in the town are 75 per cent complete. The materials needed will be advertised in the near future.

Four shovels are working on excavation on the Boulder City-Hoover Dam railroad. These shovels are working two shifts. The effort to drive piling for the bridges has been abandoned, and timber bents will be used.

Start of huge tunneling program at Boulder Dam

View of 8-ft. adit being driven by Six Companies, Inc., from the Arizona side of Black Canyon gorge to tap the middle of the two 50-ft. diversion tunnels to be built on that side of the river. A similar adit is being driven on the Nevada side of the gorge.

Large Graving Dock to Be Built at Southampton, England

The Southern Railway of England has just placed a contract for the construction of what is said to be the world's largest graving dock at Millbrook. As the dock must be ready by the fall of 1933 to receive the new 73,000-ton Cunard liner, the work will be expedited by having the contract performed by the forces of two concerns, John Mowlem & Co., Ltd., London, and Edmund Nuttall & Co., Ltd., Manchester. The value of the contract is more than $5,000,000 and the entire plan, including dredging, is expected to involve an expenditure of $9,250,000.

The dock will be 1,200 ft. long, 135 ft. wide at the entrance, and will have a depth of 45 ft. to the top of the blocks at high water neap tides. The new Cunarder will be 1,018 ft. long.

Wages, Materials Prices and Unit Costs Being Paid by Contractors in Fourteen States

THE accompanying tabulations of wage rates, materials prices and unit costs were furnished by contractors in 23 cities. They are prices actually being paid currently for construction. The brick prices check almost exactly with those published monthly in *Engineering News-Record*. So do cement prices in Chicago and Cleveland. Elsewhere there is some difference between the more or less formal quotation and the actual price. In Boston, for example, the difference amounts to 25c.; in Atlanta, to 35c.

A Boston contractor gives $19 as his erection cost on steel. This checks exactly with the figure given by a contractor of New Britain, Conn. The cost in Albany is given as $6.50, and in southern Indiana and Illinois $6. The other prices in the tabulation are cost of steel in place.

WAGES, MATERIALS PRICES AND UNIT COSTS PAID BY CONTRACTORS IN FOURTEEN STATES

	New Britain	Boston	Newark	Atlantic City	Rochester	Seymour, Ind.	So. Indiana and Illinois	Illinois: Gibson City	Illinois: Peoria	Illinois: Chicago	Clarksburg, W. Va.	La Junta, Colo.
HOURLY RATES												
Bricklayer	$1.00	$1.50	$1.93¾	$1.75	$1.58½	.....	.....	.....	$1.50	.....	$1.50	.....
Plasterer	1.00	1.62½	1.93¾	.....	1.58½	.....	$0.50	.....	1.50	$1.50	1.50	.....
Carpenter	.90	1.37½	1.65	1.00	1.26½	.....	.....	.....	1.20	.....	1.00	$0.75@1
Ironworker	.....	1.37½	2.00	1.00	.....	.....	.60	.....	1.25	.....	0.75	.....
Semi-skilled	0.55	0.85	.....	0.60	.....	0.50	0.50@0.65	$0.42½	0.75	.....	0.50	.....
Common	0.45	0.80	1.00	0.45	0.70	0.35	0.30	0.32	0.40@0.75	0.97½	0.40	0.50
How much below scale?	10@20%	....	Scale	15%	Scale	Below	.....	.....	Scale	.....	Scale	Skilled 25%
Will wages go lower?	....	....	No	No	No	Yes	No	Yes	No	.....	Common	.....
MATERIALS PRICES (delivered at site)												
Structural steel	....	54@72	.....	80.00	.....	.....	52.00	80.00	60@62	.....	56.00	66.80
Structural timbers	....	52.00	.....	75.00	.....	.....	23.75	36.00	28@45	.....	.....	(treat) 60
Cement, net	....	1.95	.....	2.30	1.75	1.59	1.35	1.54	1.52@1.60	1.95	1.98	2.002
Hollow tile	.....	.....	(4-in.) 0.08	.....	.....	.....	.....	.....	60.00	.....	(4-in.) 054	.....
Common brick	11.25	16.50	12.00	19.00	17.50	12.50	.....	.....	12.50@13	.....	12.00	.....
UNIT COSTS												
Bldg. str. steel erected, ton	19.00	19.00	.....	118.00	.....	.....	6.00	.....	80.00	.....	75.00	.....
Bldg. found. reinf.-conc., cu.yd.	10.00	(plain) 2.00	.....	18.21	.....	.....	.....	.....	7.50	.....	17.00	.....
Bridge found. reinf.-conc., cu.yd.	....	....	.....	5.86	.....	.....	.....	6.50	7.50	.....	.....	.....
Reinf.-conc. paving, sq.yd.	....	....	.....	.....	.....	.....	.....	.....	(7-in.) 1.60	3.90	.....	.....

	Albany	Delaware: Dover	Delaware: Harrington	Atlanta	St. Louis (Two Contractors)		Decatur, Ill.	Cleveland	Muskegon, Mich.	Dubuque, Ia.	Salina, Kan.
HOURLY RATES											
Bricklayer	$1.25	$1.00	$0.90	$1.12½	$1.75	.....	$1.50	$1.62½	$1.50	$1.37½	.....
Plasterer	1.25	1.00	0.90	1.00	.....	.....	1.50	1.62½	1.00	1.37½	.....
Carpenter	1@1.25	0.60	0.40	0.40@0.60	1.50	1.50	0.80@1.10	1.37½	0.70@0.90	1.00	.....
Iron worker	.....	.....	.....	.....	1.75	.....	.....	1.50	.....	0.60@1	.....
Semi-skilled	.....	0.45	0.25	.....	1.20	.....	0.50	.....	.....	0.40	.....
Common	.....	0.30@0.45	0.20	0.15@0.20	0.87½	0.87½	0.40	0.87½	0.35	0.40	$0.35@0.40
How much below scale?	15%	.....	25%	.....	Scale	Scale	.....	Scale	com. 5c.	Scale	5c
Will wages go lower?	Yes	.....	No	.....	No	No	Yes	.....	com. 5c.	No	Yes
MATERIALS PRICES (delivered at site)											
Structural steel	70.00	.....	50.00	.....	58.00	.....	58.00	.....	.....	.....	.....
Structural timbers	38@48	.....	40.00	36.00	40@58	.....	33.00	44.00	31.00	.....	.....
Cement, net	2.08	.....	2.12	2.00	1.20	2.00	1.50	1.40	1.35	.....	.....
Hollow tile	.....	.....	.....	.0884	.....	.....	.....	.....	(5-in.) 0.05	.....	.....
Common brick	11.00	18.00	13.00	11.00	14.00	.....	15.00	14.00	13.00	.....	14.00
UNIT COSTS											
Bldg. str. steel erected, ton	6.50	120.00	60.00	.....	72.00	.....	72.00	80.00	64.00	.....	.....
Bldg. found. rein.-conc., cu.yd.	9.00	.....	16.00	.....	5.75	.....	.....	9.50	12.80	.....	.....
Bridge found. rein.-conc., cu.yd.	8.75	23.00	25.00	.....	.....	.....	.....	.....	.....	.....	.....
Reinf.-conc. paving, sq.yd.	.....	(cu.yd.) 11.40	12.00	.....	.....	.....	.....	.....	.....	.....	.....

In Dover, Del., plain concrete paving costs $11.40 per cubic yard. The Peoria cost of $17.50 for reinforced concrete does not include formwork. At Muskegon, Mich., common labor at 35c. is 5c. below the 1930 level, 10c. below the 1929, and is expected to drop another 5c. Lumber costs $27 for 2x4, 2x6 and 2x8, and $31 for 2x10 and 2x12.

Paving and Cement Costs

Paving costs in four Southern cities have been complied as follows by I. Ewig, city engineer of San Antonio:

	San Antonio	Fort Worth	Dallas	New Orleans
Conc. curb per foot	$0.46	$0.50	$0.80	$0.76
2-in. rock asphalt topping	1.15	1.20	1.35	1.60
Bitulithic topping	1.35	....	1.35	1.46
Conc. base	1.30*	1.20	1.15	1.48

*Now $1.10.

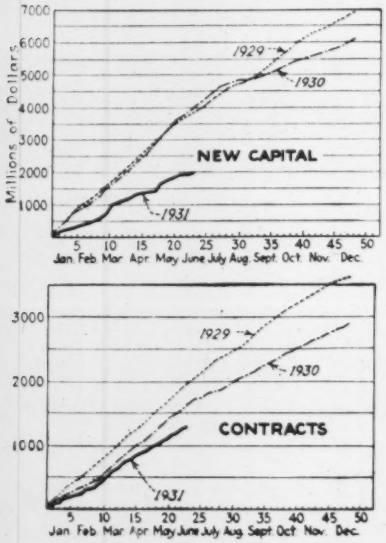
Cement at Kansas City costs $1.28 net, compared with $1.50 in March and $1.75 a year ago. Price at Iola, Kan., mill is $1.10 for last four months and $1.85 a year ago.

Cement f.o.b. Nashville costs $1.67, compared with $2.15 in March, 1930. From dealer's warehouse delivered in less than car lots the price is $2, compared with $2.03 in Mach and April and $3.44 in March, 1930.

Capital and Contracts

New capital issues of the first two weeks of June totalled 23 and 22 millions respectively. The current week's issues include $1,000,000 Richmond 4¼s for streets and sewers, $700,000 Auburn, N. Y., school 3½s, and $390,000 Norwalk, Conn., 3¾s and 5s for sewage disposal.

Contracts in the first two weeks of this month totaled 56 and 39 millions, compared with 97 and 63 in June, 1930. Cumulative figures are 1,293 millions this year and 1,709 millions last year.



Personal Notes

H. A. B. PRINDLE has been appointed engineer in charge of the new office of the Ford, Bacon & Davis Construction Corp., opened in Covington, Tenn., in connection with the construction of the 100-mile extension of the Memphis Natural Gas Co.'s pipe line from Memphis to Jackson, Tenn. Mr. Prindle is also in charge of the construction work.

S. H. MCCRORY has been selected to head the Bureau of Agricultural Engineering, authorized by act of the last Congress to be part of the Department of Agriculture, taking the place of the Division of Agricultural Engineering of the Bureau of Public Roads. Mr. McCrory has been with the department 24 years and is a past-president of the American Society of Agricultural Engineers.

HERBERT V. CLOTTS has recently been made assistant director of irrigation in the Indian Service, U. S. Department of the Interior, with headquarters at Los Angeles, where he will be in charge of the field office of the service, which handles all Indian irrigation and water-development matters.

OSSIAN E. CARR, former city manager of Forth Worth, Tex., has been chosen city manager for Oakland, Calif., and will assume his new duties about July 8. Mr. Carr has served as city manager of Cadillac, Mich.; Niagara Falls, N. Y.; Dubuque, Iowa; Springfield, Ohio; and Fort Worth, Tex. He is a member of the American Society of Civil Engineers.

MAXWELL W. UPSON, of New York City, president of the Raymond Concrete Pile Co., received the honorary degree of Doctor of Engineering from the University of North Dakota at its 43d annual commencement. Mr. Upson was graduated from the university in 1896.

SOCIETY CALENDAR

AMERICAN SOCIETY OF CIVIL ENGINEERS, New York; summer meeting, Tacoma, Wash., July 8-10.

AMERICAN SOCIETY FOR TESTING MATERIALS, Philadelphia; 34th annual meeting, Chicago, June 22-26.

AMERICAN SOCIETY OF MUNICIPAL ENGINEERS announces the results of a letter ballot for members of the executive committee. States having twenty or more active members are entitled to a member on the executive committee. Other members are the 22 past-presidents. The newly elected members are as follows: Massachusetts, Harrison P. Eddy; Michigan, Perry A. Fellows; Missouri, Hymen Shifrin; New Jersey, George W. Andress; New York, Clarence D. Pollock; Illinois, W. W. De Berard; Louisiana, Bryson Vallas; Ohio, George B. Gascoigne; Pennsylvania, Thomas Buckley.

NATIONAL SAND AND GRAVEL ASSOCIATION will hold its sixteenth annual convention in Pittsburgh, Pa., Jan. 27-29, 1932. As the National Ready Mixed Concrete Association will hold its second annual convention in the same city Jan. 25-26, the two associations have decided to have a common machinery and equipment exhibition during the week.

NEW ENGLAND WATER WORKS ASSOCIATION and the Boston Society of Civil Engineers will hold their annual outing June 23 at the Sandy Burr Country Club, Wayland, Mass.

NEW YORK STATE SEWAGE WORKS ASSOCIATION held its spring meeting in Freeport June 5-6, with 175 registered. At the business meeting a brief announcement was made regarding two annual awards to be known as the Kenneth Allen memorial awards for excellence in technical papers and for excellence in annual reports on plant operation. At the technical session papers were read on "Present and Future Status of Sewerage and Sewage Treatment on Long Island," by A. F. Dappert, assistant sanitarian, New York state department of health, and on "Sanitary Engineering in a County Health Department," by R. E. Cook, sanitary engineer, Suffolk County health department. At a round-table discussion there were discussions on "What a Sewage Plant Operator Should Know," led by Earle B. Phelps; "What Sewage Tests Can the Small Plant Operator Make?" led by Morris Cohn; "Advantages and Disadvantages of Covered Drying Beds," led by John F. Skinner; "Advantages and Disadvantages of Covered Settling Tanks," led by Horace A. Chase; and "Gas Collection From the Digestion of Activated Sludge at Rockville Center," led by Weston Gavett. More than twenty manufacturers had exhibits on display. The next meeting of the association will probably be held in Ithaca in October.

ROCHESTER ENGINEERING SOCIETY has elected George C. Wright president, R. T. Soule and P. F. Stephens vice-presidents, M. D. Lee recording secretary and Howard Harding treasurer.

Obituary

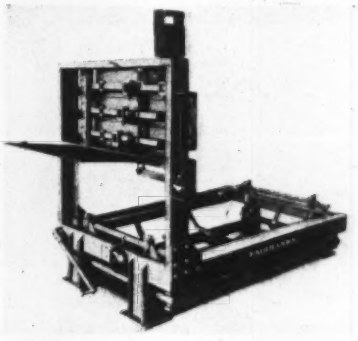
EDWARD CHARLES STRATHMANN, president and treasurer of the Strathmann Construction Co., of Indianapolis, died recently at his home of a heart attack. Mr. Strathmann, who was 57 years old, was identified with the construction of some of the largest buildings in Indiana.

ALGER ADAMS CONGER, consulting hydraulic engineer for the New England Power Association, died at his home in Wellesley Hills, Mass., on May 26. Mr. Conger, after his graduation from Cornell University in 1897, was for several years with the Deep Waterways Commission laying out a route for a proposed ship canal from the Great Lakes to the Hudson River and later was with the Michigan-Lake Superior Power Co. at Sault Ste. Marie on the construction of a 40,000-hp. hydro-electric development. From 1906 to 1911 he was in the hydraulic department of the J. G. White Co., working on the designs of the developments at West Buxton, Me.; Vernon, Vt.; Comerio, Porto Rico; and Ocoee, Tenn. On the formation in 1911 of the Power Construction Co., the engineering and construction subsidiary of the New England Power Co., Mr. Conger was made hydraulic engineer and had an important part in the design and construction of the following plants: Deerfield No. 2, No. 3, No. 4 and No. 5; Somerset reservoir; Searsburg; Harriman, and Sherman stations, and the Bellows Falls and Fifteen Mile Falls development on the Connecticut River. For the last ten years, in addition to acting in a general consulting capacity, he had been in charge of the investigation of power possibilities. Mr. Conger was a member of the American Society of Civil Engineers and of the Boston Society of Civil Engineers.

Construction Equipment and Materials

Scale Weighs Aggregates in Mixer Skip

To facilitate accurate proportioning of concrete aggregates, Fairbanks, Morse & Co., Chicago, Ill., have made available to contractors a new Fairbanks skip mixer scale designed to eliminate guesswork in concrete construction. This unit consists of an all-



Proportioning scale for mixer skip

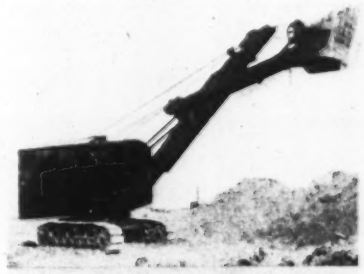
steel welded frame and a beam box in which is mounted a specially designed knife edge lever scale with swiveled arm connections. Suspended from the scale levers is a welded steel spider on which the skip is lowered for weighing. The scale is equipped with three ingredient beams of non-corrosive metal graduated to 1,500 lb. by 2-lb. increments, each of which is furnished with both a main and a fractional poise. There is also a tare for balancing the weight of the skip. These beams are inclosed in a steel beam box with doors on both sides. Either one or both of the doors may be opened during operation, or the poises may be set by an inspector and the beam box locked during operation. A springless double faced telltale showing "over and under" is mounted on a swivel so that it can be swung to any angle to insure easy reading irrespective of the position of the operator. This telltale is built on the principle of a pendulum on a substantial shaft and is mounted on non-corrosive bearings well protected from dust.

When the scale is set up for operation, the transport wheels with which it is provided are removed and the scale is allowed to rest on the ground on four large steel plate pedestals. The scale is placed adjacent to the mixer in such a position that when the skip is lowered it rests on the steel platform. With the skip in place, pressing a foot lever slacks the cables and a disengaging joint between the skip and the mixer separates the two so that the scale bears the full weight of the skip. Then the poise on the tare beam is moved until the indicator shows balance, after which poises on the three other beams are set in their predetermined places for the particular ingredients. Materials are dumped into the skip from wheelbarrows. Only the last load of any particular ingredient requires care in dumping. The over and under indicator tells when the beam is approaching balance.

As the skip is raised and leaves the platform it trips the automatic safety gear, which drops the platform to rest on the steel ground plates. Hence, when the empty skip is returned, care in lowering into position is not necessary, for the pivots, bearings and all parts of the mechanism have been freed by the automatic device.

Convertible 1-Cu.Yd. Excavator

An improved full revolving 1-cu.yd. excavator equipped with gasoline, diesel or electric power which can be rigged as shovel, dragline, crane, clamshell, hoe or skimmer is now being placed in production by the Harnischfeger Corp., Milwaukee, Wis. This machine, known as the P&H model 500, follows the conventional design of this company, but has a number of added refinements. Main frames are unit alloy steel castings. Wearing parts are of alloy heat-



Convertible excavator

treated steel. Drums are in tandem and operate through a power clutch control. A minimum number of gear reductions makes the machine extremely simple. Crawler frames are cast from alloy steel and are bolted directly to the car body. Crawlers employ a double sprocket drive directly engaging the link pins. Twelve pairs of alloy heat-treated rollers distribute the weight of the machine through the treads to the ground. Shoes of various widths are available.

With the shovel rigging the patented P&H chain crowd with fast return is used. The boom is of box-section construction, while the 1-cu.yd. dipper has a manganese steel front and renewable reversible teeth. Dragline and crane booms are of trussed structural design. As a dragline, the machine has a 1-yd. bucket on a 40-ft. boom; as a crane, with the same length boom, it is rated at 31,700 lb. at 12-ft. radius. A fully inclosed steel cab is standard equipment.

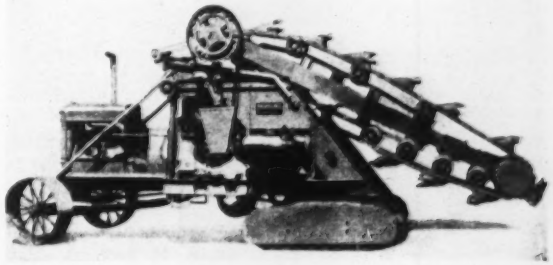
Two 1½-Ton Trucks

Identical throughout, with the exception of transmission and rear axles, models A-2 and B-2 trucks of 1½-ton rated capacity have been announced by the International Harvester Co., Chicago, Ill. Both models are powered by four-cylinder L-head motors developing 39 hp. at 2,400 r.p.m., provided with force feed lubrication and specially designed cylinder heads for maximum fuel economy. The wheelbase is 136 in., with 150 in. optional in model A-2. The difference between the two trucks is in the transmission and rear axle assembly. In model A-2, the rear axle is of the single-speed, spiral bevel drive type; with a transmission providing four forward speeds and one reverse. Model B-2 is fitted with a two-speed axle which, coupled with a three-speed transmission, provides six forward and two reverse speeds.

Trenching Machine Fitted With Three-Speed Transmission

Several improvements resulting in increased operating speed and efficiency have been made in the model 35 Parsons pipe line trencher of the National Equipment Corp., Milwaukee, Wis. Changes include the addition of a three-speed transmission, lengthening the frame by 3 ft. with stronger construction, a wider conveyor belt and new heavy-duty Kochring type cast-steel multiplanes. Lengthening the frame has made it possible to introduce the new transmission directly behind the engine, giving three speed ranges throughout the machine. This feature provides adaptibility to every soil condition, with many combinations of speeds in the bucket line, traction and conveyor. Extension of the frame also provides additional counterweight. The

(Continued on p. 1034)



Trenching machine in traveling position

Current Construction Unit Prices

Levee Work on Mississippi Tributaries

EARTHWORK construction totaling 4,913,000 cu.yd. was let in March, 1931, by the U. S. Engineer Office at Memphis. The work is in the upper St. Francis, Upper Yazoo and White River levee districts with yardages of 247,000, 3,466,000 and 1,510,000 cu.yd. respectively. It was let in six items at the prices given below:

Item	Cu.Yd.	Cents Per Cu.Yd.
4-H	200,000	17.4
4-I	47,000	17.4
35-A	16,000	30.0
28-A, B, C	2,550,000	13.5
14-A	900,000	24.6
43	1,200,000	27.2

Item 4-H covers 400 ft. landside enlargement and 3,500 ft. of loop levee. Material is obtained from riverside borrowpits. The levee has a 30-ft. crown and 1 on 3½ side slopes. Item 4-I is riverside enlargement of the levee below the Cairo bridge approach for a distance of 4,800 ft. Crown is 10 ft., slopes 1 on 3½. Item 35-A is restoration of four parcels of sunken levee on the Norfolk Loop for respective distances of 990, 440, 313 and 227 ft. Item 28-A is for two riverside enlargements of 1,982 and 3,495 ft., and a new levee 3,466 ft. long. Item 28-B is for 10,317 ft. of new levee. Item 28-C is for 12,000 ft. of new levee. On top of each of these three items is a 14-ft. roadway for inspection purposes. Item 14-A is a modified straddle enlargement 4,982 ft. long in the existing levee across Ward Lake. Due to the probability of foundation subsidence, the enlargement is made from the ground up across the entire base in layers 7 ft. thick. Item 43 is for 6,893 ft. of new levee.

Eight Spans of 3-Mile Viaduct on Jersey Meadows

CONTRACT was let in April, 1931, for eight spans totaling about 2,500 ft. of the elevated steel structure of route 25 across the Passaic and Hackensack rivers and the Hackensack meadows. The whole project, the connecting link between Holland Tunnel traffic and the subway section of this road in Jersey City and the completed section through Newark toward Elizabeth, was outlined on p. 973 of the June 12, 1930, issue of *ENR*. It is 15,000 ft. long and will cost $20,000,000. The foundations were placed under other contracts.

The present contract is No. 46 for section 4A, covering steel superstructure as shown in the drawing. It covers manufacture, delivery and erection from a point 200 ft. east of the west shore line of the Hackensack River to a point east of Central Ave. in Kearny. The time of completion is thirteen months.

Complete unit prices are given of the six bidders. Contract was let to the Phoenix Bridge Co.

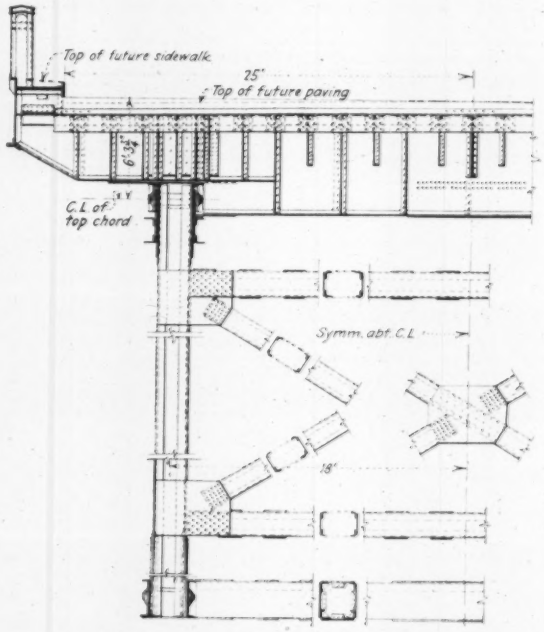


Fig. 2—Typical cross-section of elevated highway east of intermediate ramp section

	15,500 Tons Structural Steel	1,450 Lin.Ft. Type A Rail	6,120 Lin.Ft. Type B Rail	400 Tons Steel Castings	Total
Phoenix Bridge, Phoenix, Pa.	$99.60	$4.65	$9.25	$163.00	$1,672,353
Harris Str. Steel, New York	101.75	4.80	9.50	170.00	1,710,225
Mt. Vernon Bridge, Mt. Vernon, N. Y.	104.50	4.80	9.90	157.00	1,750,098
McClintic-Marshall, Bethlehem, Pa.	108.80	5.00	8.75	160.00	1,811,200
Fort Pitt Bridge Wks., Pittsburgh	109.00	7.97	8.18	174.80	1,821,038
American Bridge, New York	116.60	5.15	10.45	158.00	1,941,922
Average	107.00	5.39	9.34	163.80	1,784,473
Low's per cent from average	8	14	1	½	6

Laying Cast-Iron Water Mains

PEMBROKE, Mass., is constructing a waterworks system. Contract was let in April, 1931, for unloading, distributing and laying (1) 76,700 lin.ft. 6- to 10-in. standard bell-and-spigot pipe and 300 ft. 8- to 10-in. flexible-joint pipe at a stream crossing; (2) 162 gate valves, 6- to 10-in.; (3) 80 fire hydrants; (4) constructing 310 service connections

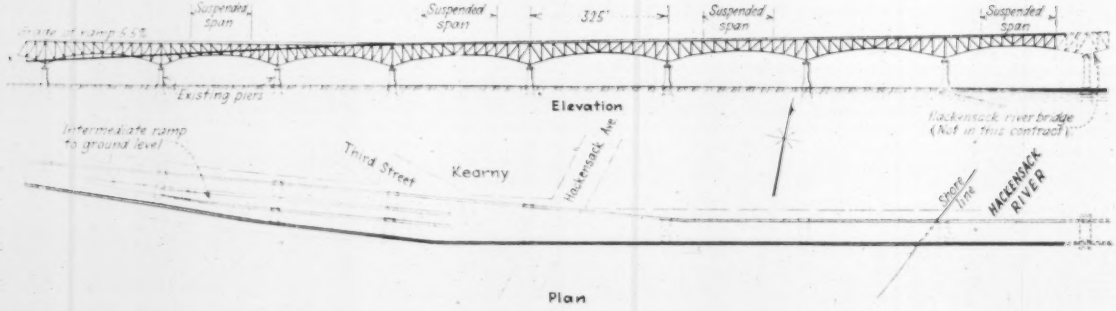
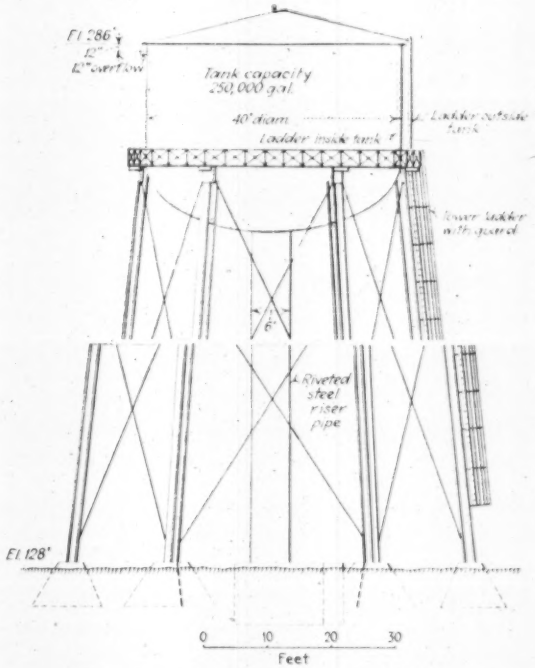


Fig. 1—Plan and elevation of elevated highway route 25 in northern New Jersey

Current Construction Unit Prices

from water main to point inside curb line; (5) constructing elevated tank structure.

Materials are furnished by the town. These include A.W.W.A. class B and C cast-iron pipe and fittings supplied by the Herbert Kennedy Co., agent for the Pont-à-Mousson Cast Iron Pipe Foundry, Nancy, France; Chapman gate valves and boxes; Columbian hydrants; and copper service pipe. All materials will be delivered at Hanover, Southhampton or Bourrage station of the New York, New



Construction of 250,000-gal. tank and tower

Haven & Hartford, f.o.b. cars, as will all the other materials. The contractor furnishes and erects the elevated storage tank.

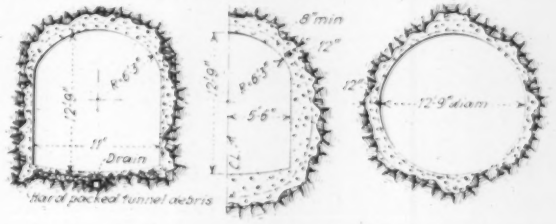
The accompanying tabulation lists the principal unit prices of the lowest three bidders, all of Massachusetts: A, L. P. Frederico & Suisi Co. (contract), 4549 Wales Pl., Dorchester; B, Anthony Ross & Son, 97 Bedford St., Lexington; C, R. H. Newell Co., Uxbridge. Lump-sum bids were received for the elevated tank structure, and these prices were remarkably close for all fifteen bidders. The lowest price was $18,000, the successful contractor's price was $19,000, the highest bid was $23,500, and the average was $20,580. The drawing shows the construction of this tank. Fay, Spofford & Thorndike, 44 School St., Boston, are consulting engineers.

		A	B	C
Laying c.-i. pipe and fittings:	Unit	Amount	Unit	Unit
21,100 ft. 10-in. std. bell-and-spigot	$0.44	$9,284	$0.55	$0.50
48,600 ft. 8-in. std. bell-and-spigot	.44	21,384	.50	.45
7,000 ft. 6-in. std. bell-and-spigot	.44	3,080	.45	.40
Setting gate valves and boxes:				
12—10-in.	3.00	36	3.00	3.00
50—8-in.	2.00	100	3.00	2.00
100—6-in.	2.00	200	2.00	2.00
Setting 80 fire hydrants	5.00	400	5.00	8.00
Install service fittings and boxes:				
300—¾-in.	2.00	600	1.00	1.60
15—1½-in.	2.00	30	1.00	2.00
Install copper service pipe:				
6,500 ft. ¾-in. in open trench	.30	1,950	.35	.38
1,400 ft. 1½-in. in open trench	.30	420	.35	.40
1,000 ft. ¾-in by driving or jetting	.30	300	.35	.28
100 ft. 1½-in. by driving or jetting	.30	30	.35	.30
Elevated tank complete	19,000.00	19,000	20,417.00	19,750.00
Totals		$65,094	$72,103.00	$76,966.00

Coldbrook-Swift Tunnel Near Boston

COLDBROOK-SWIFT concrete-lined water tunnel in the towns of Barre, Hardwick and Greenwich, Mass., will be an extension, 9.5 miles westerly to the valley of the Swift River, of the Wachusett-Coldbrook tunnel already constructed between the Wachusett reservoir and the Ware River near Coldbrook, Mass. It will include sinking five shafts, constructing intake control structures in Greenwich and connecting with the Wachusett-Coldbrook tunnel.

The Massachusetts Metropolitan District Water Supply Commission received bids March 27, 1931; the low bidder was the Wenzel & Henoch Construction Co., 1524 North 27th St., Milwaukee, Wis. Its bid was $4,978,032, or 14 per cent below the second bidder and 21 per cent below the



Typical section of Coldbrook-Swift tunnel

average of the thirteen bids. Due to bonding difficulties final formalities of contract ratification were not observed until late in May.

Tunnel excavation is the principal item of work and amounts to $3,388,000, or 68 per cent of the contract price. Contract unit price is $8.80 per cubic yard, and the average of the thirteen prices is $10.44.

Unit prices are given of the lowest three bidders: A, Wenzel & Henoch; B, Dravo Contracting Co., Pitt-burgh, $5,804,419; C, West Construction Co., West Rutland, Mass., $5,959,137. F. E. Winsor is chief engineer of the commission.

	A	B	C
700 cu.yd. earth excav., shafts 9, 10 and 11	$7.00	$12.50	$11.25
10,500 cu.yd. rock excav., shafts 9, 10 and 11	14.00	15.00	15.75
285,000 cu.yd. excav. in tunnel	8.80	8.50	9.75
800 cu.yd. enlargement of shafts and tunnel	10.00	8.50	13.50
55,900 lin.ft. shaft and tunnel drainage	3.00	3.50	0.50
37,500 cu.yd. earth excav. not included in Item 1	1.50	1.75	2.00
5,500 cu.yd. other rock excav.	6.00	4.00	2.55
860 lin.ft. forms for shafts 9, 10 and 11	15.00	4.00	13.50
54,880 lin.ft. forms for tunnel	1.11	1.80	2.15
2,600 cu.yd. concrete masonry in shafts 9, 10 and 11	8.00	27.00	12.00
123,000 cu.yd. concrete masonry in tunnel	3.00	7.10	7.90
4,400 cu.yd. concrete masonry not included in items 10 or 11	11.00	24.00	20.15
800 cu.yd. excess concrete masonry in shafts and tunnel at $3.00 per cu.yd.	3.00	3.00	3.00
1,000 M. ft. b.m. permanent timbering in tunnel	45.00	115.00	70.00
100 M. ft. b.m. temporary timbering in tunnel	45.00	115.00	80.00
4,000 cu.yd. dry packing	2.00	2.50	3.00
3,500 lin.ft. drilling holes in rock or masonry	0.50	0.60	0.50
11,000 lin.ft. steel pipe for grouting, etc.	.35	.40	.20
1,000 connections for grouting	1.00	1.50	1.00
600 tons sand for grout	2.50	3.50	3.00
4,000 cu.yd. mixing and placing grout	1.00	8.50	10.00
225,000 bbl. portland cement	2.15	2.60	2.17
200 bbl. special portland cement	5.00	3.50	5.00
200,000 lb. steel for reinforcing concrete	.05	.04	.06
3,000 lin.ft. gunite protective coating of tunnel	2.50	3.50	3.00
10,000 cu.yd. refilling and embanking	.50	1.00	1.00
800 cu.yd. removal of soil	1.00	1.00	2.00
600 cu.yd. surface dressing of top soil	1.50	1.00	2.00
2 acres seeding and grassing	500.00	250.00	150.00
300 lin.ft. tile pipe	1.00	.90	1.50
275,000 lb. misc. cast iron, wrought iron and steel	.09	.07½	.10
45,000 lb. galvanizing	.05	.02½	.15
2,000 lb. misc. brass, bronze and copper	.50	.60	1.00
20,000 lb. setting metal work	.03	.03	.03
60 lin.ft. reinforced concrete ladders	4.00	2.50	5.00
25 M. ft. b.m. misc. timber and lumber	60.00	90.00	100.00
400 lin.ft. constructing circular section tunnel	10.00	10.00	10.00
90 cu.yd. stone masonry	60.00	60.00	70.00
2,050 cu.yd. riprap	1.00	2.25	3.00
375 cu.yd. paving	3.00	6.50	6.00
1,500 cu.yd. crushed stone, gravel and sand	1.00	3.00	3.00
45 months medical and hospital services	200.00	300.00	300.00
45 months sanitary services	100.00	700.00	900.00
4 house locker houses	5,000.00	3,250.00	800.00
Cleaning up (lump sum)	1,000.00	20,000.00	1,000.00

Trenching Machine

(Continued from p. 1031)

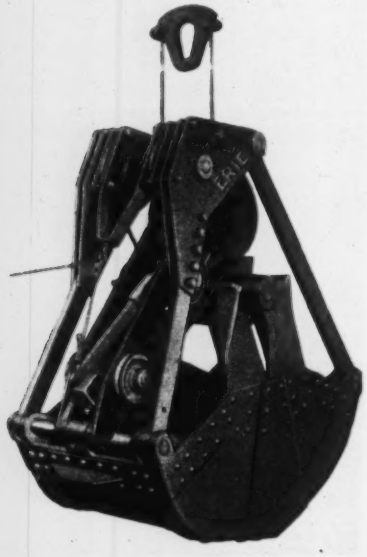
conveyor has been equipped with a belt giving an effective dirt-carrying capacity 6 in. wider than the old design. The belt is equipped with guide clips to prevent any movement off center and with cleats to avoid possible slippage of material. Koehring-type heavy-duty multiplanes with cast-steel frames and self-cleaning tumblers have been installed. Another improvement is the addition of a vacuum device for filling the gasoline tank from a barrel standing on the ground.

Single-Line Clamshell Bucket

With the announcement of a new hook-on or single-line type of clamshell bucket, the Erie Steel Construction Co., Erie, Pa., has completed its line and is now offering a type and size of bucket for every requirement of digging and material handling. The new hook-on bucket operates from any type of crane, and is instantly attached or detached by simply throwing the holding yoke over the crane hook.

In operation, the open bucket is placed on the material, the crane hook being lowered further to permit the power arm to travel downward until a latch in the arm engages the main hinge member of the bucket. Then, by simply raising the crane hook, the bucket is closed and filled. To discharge the load the operator pulls a trip rope disengaging a latch, thus permitting the bucket to open. A quick and positive latching mechanism is provided, which is securely locked in position when the bucket is closed, so that it cannot be accidentally discharged. The shock of opening is cushioned by the use of snubber sheaves and by heavy bumper springs against which the power arm comes to rest.

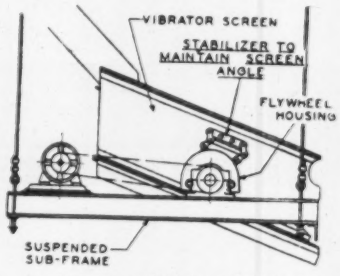
For long life under severe service, all-steel construction is utilized. High-carbon steel lips extend to the top of the scoop and tie in with the hinges. The back band bends entirely around the scoop and also ties in with the hinges. All corner bars are drop forged and are attached by riveted corner brackets that extend over the tops of the scoops to relieve downthrust on the rivets. Moving parts are bronze bushed and lubricated by the Alemite system.



Clamshell bucket of hook-on type

Mechanical Stabilizing Unit for Vibrating Screens

While testing vibrating screens the development department of the Stephens-Adamson Mfg. Co., Aurora, Ill., conceived the idea of a mechanical stabilizer to prevent the bucking and rocking which so often results from surges of material. The idea worked out so well that it has now been adapted to all screens produced by the company. As now manufactured, the balancing springs which formerly secured the screen body have been replaced by a single mechanical unit called a stabilizer. This is mounted on one side of the screen to hold the unit at a definite angle yet offers no resistance to the vibrating action. The angle can be adjusted by simply loosening two bolts on one side, a decided simplification over the former mounting, where pressure on four springs had to be adjusted.



Screen stabilizing device

The stabilizer consists of two pairs of short cast-steel arms, each joined in the middle and held parallel by a heavy crossbar. One end of each arm pivots on the flywheel housing, which is solidly mounted on the heavy steel subframe. The other end of each arm is free to move in a shackle on the screen body. Reference to the illustration will show that both arms are free to swing or bend in any direction, but both must act together. Even with screens having a long throw, movement of the stabilizer arms is so slight that there is practically no wear on the parts. Lubrication of hinge pins is by means of automatic feeders that force oil under constant pressure to the moving surfaces.

New Publications

Excavators—Bulletin 3105 of the GENERAL EXCAVATOR CO., Marion, Ohio, describes in detail the General excavator and accessory equipment for clamshell, dragline, back hoe, shovel, skimmer, backfiller and crane operation.

Pipe Lines—Photographs and descriptions of wood and steel pipe line installation made by the CONTINENTAL PIPE MFG. CO., INC., Woolworth Building, New York City, are contained in a recent bulletin.

Hoists and Cableways — Electro - Auto hoists, cable dragscrapers and slackline cableway excavators, which combine automatic operation with remote control features, are described in supplementary catalog 95, a 16-p. illustrated publication of R. H. BEAUMONT CO., 319 Arch St., Philadelphia, Pa.

Sanitary Truck Bodies—Completely inclosed industrial bodies for motor truck mounting manufactured by INTERNATIONAL CITIES SANITATION SERVICE, INC., 270 Broadway, New York City, are described in a 20-p. illustrated bulletin recently issued.

Pumps—Non-clogging centrifugal pumps for sewage and industrial services are described in a 16-p. illustrated bulletin 139 of the MORRIS MACHINE WORKS, Baldwinsville, N. Y.

Ditching Machine—A folder giving detailed specifications of the model 90 ditcher, a small machine that meets the needs of public utility companies and sewer and water contractors, has been issued by the AUSTIN MACHINERY CORP., Muskegon, Mich.

Hydrants—A folder describing the Ludlow Diamond, a new fire hydrant with an appearance in harmony with modern surroundings, has been issued by the LUDLOW VALVE MFG. CO., Troy, N. Y.

Drafting Supplies. — EBERHARD FABER PENCIL CO., 37 Greenpoint Ave., Brooklyn, N. Y., has issued a 150-p. pocket-size catalog describing and illustrating a large variety of supplies for drafting room and office.

Pumps—Pumps for handling liquids carrying solids in suspension are described in catalog B-1 of the DE LAVAL STEAM TURBINE CO., Trenton, N. J. This company has also prepared a leaflet describing successive pump installations at the Ross Station, Pittsburgh, Pa., which was originally equipped with centrifugal pumps driven by reciprocating engines, then with the first large geared turbine-driven centrifugal waterworks pumps to be built in the United States, and finally with a modern type of turbine-driven centrifugal pump.

Meter Boxes—GRIFFIN FOUNDRY & MFG. CO., Rome, Ga., is distributing a 33-p. pocket-size catalog describing meter boxes and other castings for municipal services.

Dump Cars—Electrically operated railway dump cars arranged for either remote control or entirely automatic action on a fixed cycle are described in a 10-p. illustrated bulletin 1239 of the ATLAS CAR & MFG. CO., Cleveland, Ohio.

Activated Carbon—"Taste and Odor Removal With Powdered Activated Carbon," is the title of a 4-p. illustrated pamphlet now being distributed by the INDUSTRIAL CHEMICAL SALES CO., INC., 230 Park Ave., New York City.

Stadium Decks—Parthenon steel and concrete seating decks for stadiums, arenas and auditoriums are described in a 4-p. illustrated folder of the PORETE MFG. CO., 346 Riverside Ave., Newark, N. J. The materials used include precast concrete slabs, structural steel riser joints and knee brackets and timber seats, giving a total dead load of only 28 lb. per sq.ft.

Crawler Treads—Advantages of crawler equipment for heavy hauling operations are discussed in an 8-p. circular which may be secured from the TRACKSON CO., 1320 South First St., Milwaukee, Wis.

Diesel Engines—Large diesel engines of three, four, six or eight cylinders rated at from 150 to 480 hp. when operated at 300 to 350 r.p.m. are described in a folder now being distributed by the COOPER-BESSEMER CORP., Mount Vernon, Ohio.

Hydraulic Standards—The sixth edition of the *Standards* of the HYDRAULIC SOCIETY, 90 West St., New York City, has been issued as a booklet of 96 pages. New material added includes an index, a list showing the different types of pumps made by member companies, illustrations showing the rotation of centrifugal pumps, definitions and illustrations of thrust bearings, directions for connecting suction pipe to centrifugal pumps, recommendations for pumping special liquids and a section on the friction of paper stock in cast-iron pipe. The book is priced at $1 per copy.

CONSTRUCTION NEWS

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Some of the Week's Large Projects

For further details turn to the appropriate sections in this issue

Location	Project	Cost	Status
Sewers			
South Bend (Ind.)	Sewers and disposal plant	$2,422,037	Proposed
Streets and Roads			
Seattle	Paving and bridge approaches	2,125,000	Bids asked
Montana and Wyoming	Road	1,000,000	Bids asked
Sports and Parks			
San Francisco	Race track, club, etc	1,500,000	Proposed
Chicago	Golf course, swimming pools, etc	1,000,000	Proposed
Unclassified			
Texas	Oil pipe line	2,500,000	Proposed
Federal Government			
Washington	Senate office and library buildings	9,000,000	Proposed
Buildings			
Stapleton (N. Y.)	Hospital	2,500,000	Proposed
Chattanooga	Post office	1,250,000	Proposed
Seattle	Marine hospital	1,269,900	Contract
Worcester (Mass.)	Sanitarium	1,000,000	Contract
Holmdel (N. J.)	State hospital	1,350,000	Proposed
New York	Nurses home, etc	1,000,000	Proposed
Chicago	Office	12,000,000	Bids asked
Cleveland	Detention home	1,650,000	Bids asked
Cambridge (Mass.)	Memorial chapel	1,000,000	Contract
New York	Theatre and apartments	2,500,000	Proposed
Pittsburgh	Medical building and store	1,000,000	Proposed
St. Paul (Minn.)	City hall and court house	2,221,400	Contract

WATERWORKS

PROPOSED WORK

Ark., Murfreesboro — City Council, waterworks. To exceed $25,000. E. T. Archer & Co., 609 New England Bldg., Kansas City, Mo., engrs.

Calif., San Francisco—City Council, pipe line over Altamont Pass in Alameda Co. connecting with terminus contemplated pipe line in connection with Hetch Hetchy Project across San Joaquin Valley terminating in present aqueduct of San Francisco Water Dpt., incl. pumping plants of not less than 45 m.g.d. capacity (estimates will also be made on 60 m.g.p.d. capacity). M. M. O'Shaughnessy, city engr.

Calif., San Francisco—City Council and Bd. Comrs. San Francisco Co. Red Mountain Bar Siphon in connection with Hetch Hetchy Project. $225,000. M. M. O'Shaughnessy, city engr.

Conn., Hartford—City, Engineers Dpt., City Hall, soon takes bids 40 x 68 ft., brick, rein.-con., pumping station, South Meadow Dike. To exceed $25,000. R. N. Clark, City Hall, engr. Noted Feb. 19.

Ill., Chicago—See "Sports and Parks."

Mo., St. Louis—Water Dpt., L. Day, comr., City Hall, preliminary plans, rebuilding and new equipment for boiler house at Chain Rocks Pumping Station on Mississippi River, $400,000; laying additional distribution mains, $250,000; landscape work, roadways, etc. at Howard's Bend Pumping Station on Missouri River near Hine, $46,250.

N. J., Bordentown—Mayor and Boro Council, 2,400 ft. 10 and 12 in. mains in Farnsworth Ave. $16,000. F. A. Brown, dir. Streets.

N. Y., Rockaway Point (sta. Brooklyn) Rockaway Operating Co., 421 7th Ave., New York, 1 story, 48 x 48 ft. pumping station at Roxbury, Rockaway Point. To exceed $15,000.

O., Toledo—City Council 2¼ mi. conduit for water from Broadway Pumping Station to Cherry St. $700,000. H. P. Jones & Co., 2nd Natl. Bank Bldg., engrs. to supervise construction. Fuller, McClintock, 170 Bway., New York, consult. engrs.

Tex., Overton—City, c/o M. Wilson, "waterworks, entire sewerage system. H. L. Thackwell, Jacksonville, engr.

BIDS ASKED

Ark., Magnolia—June 24, by Bd. Trustees Agricultural & Mechanical College, 435 ft. 16 in. gravel wall well, guaranteed to produce 150 g.p.m., 150 g.p.m., 250 ft. head centrifugal deep well pump and 20 hp. motor, 25,000 gal. tank on 75 ft. tower. C. A. Overstreet, pres.

Minn., Brainerd—See "Contracts Awarded."

N. J., Paterson—June 30, by Passaic Valley Water Comm., 156 Ellison St., furnishing, installing motor driven pumping equipment and founds. in pumping station Little Falls, Contr. 9: dismantling and removing old pumping machinery from property of Commission, Contr. 10, Fuller & Everett, 25 West 43rd St., New York, engrs.; adv. E.N.-R. June 18.

N. Y., New York—June 23, by Dpt. Water Supply, Gas & Electricity, Municipal Bldg., steel and c.i. mains in Elton, Morris, St. Ann's, Sheridan and Sherman Ave., Fox, Simpson, East 156th, East 158th, East 162nd, East 163rd, and East 164th Sts.

N. Y., New York—June 30, by Bd. Water Supply, G. J. Gillespie, pres., 346 Bway., ten 5 x 15 ft. and eight 6 x 15 ft. sluice-gates for Uptake and Downtake Chambers No. 2, City Tunnel No. 2, Hill View Reservoir. Contr. 239; adv. E. N.-R. June 18.

N. Y., St. George—June 23, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains, appurtenances in Depew Pl., Katan and Lockman Aves., Thompson and Warren Sts.

Tex., Taylor—City taking bids 150,000 gal. rein.-con. water reservoir with partitions for cleaning, also cooling section account artesian water and flows hot water. $35,000. Address City Board. Noted June 11.

B. C. Vancouver—June 25, by E. A. Cleveland, engr., 500 Beatty St., 3,100 ft. pressure tunnel beneath Burrard Inlet, incl. 7 ft. 6 in. diam. steel, concrete lined waterway, connecting with surface by two 400 ft. deep shafts, with steel concrete lined waterways 8 ft. in diam., 1 shaft will involve excav. in water bearing earth to depth 110 ft. below sea level $500,000; also furnishing, laying 4,700 ft. 70 in. welded steel pipe or 66 in. steel cylinder concrete pipe, $125,000.

Ont., Toronto—June 23, by W. J. Stewart, mayor, City Hall, supplying, installing ¼ mi. 54 in. connecting steel main, between high level pumping station and new reservoir on St. Clair Ave. $150,000-$200,000. R. C. Harris, City Hall, engr. Noted May 21.

CONTRACTS AWARDED

Ind., Bloomington — Bloomington Water Co., pipe line to reservoir, to Bushkirk & Dodds, Bloomington, 1¼ m.g. reservoir, to Mustard & Curry, Bloomington. Noted Apr. 16.

La., Spring Hill—D. G. Tyler, town clerk, waterworks, distribution system, to W. H. O'Toole Constr. Co., P. O. Box 784, Monroe, $30,000. Est. $40,000. Noted May 14.

Mass., Boston — Metropolitan Dist. Comm., Water Div., 20 Somerset St., 8,400 lin.ft. 60 in. steel waterpipe with necessary appurtenances and connections between Newton and Watertown, to T. J. McCue, 264 North Beacon St., Watertown, $121,455. Noted May 26 Daily.

Mass., Provincetown—Bd. Water Comrs., Town Hall, 42 x 105 ft. steel standpipe to Pittsburgh-Des Moines Steel Co., 270 Bway., New York, $22,750; found. for standpipe, to F. A. Days & Son, Provincetown, $5,736. Noted June 4.

Mich., St. Joseph—City, new pumping plant, filtration system, to Lovering & Longbottom, Ann Arbor, $129,640.

Minn., Brainerd—City, E. T. Fleenor, city clk., plant to remove manganese from city water, day labor, $35,000. Wolff & Coates, 903 Globe Bldg., St. Paul, engrs.

N. H., Keene—City, dam and reservoir, to Marsh Constr. Co., Woodsville, $20,454. Est. $50,000. Noted Apr. 23.

N. H., Wilton—Town, earth dam, concrete reservoir, and 2,000 ft. c.i. pipe, to R. H. Newell, Main St., Cybridge, Mass., $16,846. Est. $20,000. Noted May 21.

N. Y., Canajoharie—Village, 8 mi. pipe line, to W. G. Fritz Co., 60 Main St., West Orange, $25,890. Noted May 14.

N. Y., New York—Bd. Water Supply, 346 Bway., test borings in towns of Kent and Carmel, Putnam and Somers, North Salem, Lewisboro, Bedford, Newcastle and North Castle, Westchester Co., Contr. 312, to Riley Drilling Co., 280 Bway., $29,920. Noted May 21.

N. Y., New York—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., electric driven pumping plant, to H. Starkman & Bro., 132 Brook Ave., $8,660. Noted May 21.

N. D., Grand Forks—Water treatment plant, to Nelson & Carlson, Grand Forks, $55,343. Noted May 21.

W. Va., Parkersburg—City Council, laying 16 mi. mains, to Getz Bros. & Co., Baltic, O., $35,355. Noted May 7.

W. Va., Parkersburg — City Council, gate valves, to Mountain Iron & Supply Co., Parkersburg, $22,529; c.i. pipe and fittings, to United States Pipe & Fixture Co., Burlington, N. J., $81,864. Noted May 7.

Wis., Milwaukee—City, D. McKeith, comr., mains in North 3rd St., to Kehrem Bros., 2142 North 17th St., Milwaukee, $13,559.

Wis., Milwaukee — Mains in East Wisconsin Ave., to Mierswa Constr. Co., 2028 West Cherry St., $762; North Dowern Ave., to H. Hohensee, 2808 South 15th St., $4,205; West Michigan St., to Wenzel & Henoch Co., 5025 State St., $6,271. Grand total $11,238.

SEWERS

PROPOSED WORK

Conn., Stonington — Mystic Oral School for Deaf, W. J. Tucker, supt., sewage disposal plant, $15,000 or more. Engineer not selected.

Ind., South Bend—Bd. P. Wks., sewage disposal plant, main interceptor and 5 sub interceptors, $2,422,037. Burns & McDonnell Eng. Co., 406 Interstate Bldg., Kansas City, Mo., engrs. Noted Mar. 5.

Ind., Terre Haute — Sanitary sewerage system North Station $75,000. F. Kattman, Terre Haute, engr.

Mo., St. Louis—Reconstructing, repairing sewers in downtown districts $500,000; miscellaneous outlying sewers, $491,179; river outlets for various sewers, $100,000.

Mo., St. Louis—Bd. P. Serv., preliminary plans public outlet for Wherry Ave. Public Outlet Sewer. $160,000. W. W. Horner, city engr.

See proposal advertising on page 87

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LEADITE

Trade Mark Registered U.S. Pat. Office

24" and 48" c. i. Pipe in Filter Plant Gallery —*jointed with LEADITE*

Cast Iron Pipe joints in numerous Filter Plant Galleries throughout the country, are jointed with LEADITE,—for Tightness, Durability and Permanence.

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The Pioneer self-caulking material for c. i. pipe.
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Saves at least 75%.

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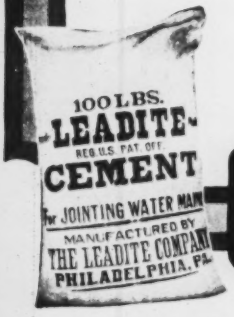

No Caulking

Sewers (Continued)

Mo., St. Louis—Bd. P. Serv., City Hall, outlet sewer in Rock Creek Dist., $185,000. W. W. Horner, city engr. Noted May 21.

Mo., Washington—Soon takes bids sanitary sewers, manholes, south side city, $30,000. W. R. Rollins & Co., 339 Railway Exch. Bldg., Kansas City, engrs.

Neb., Lincoln — Preliminary plans storm water sewers, $100,000. D. L. Erickson, city engr.

Neb., Nebraska City—Soon takes bids North Side Trunk Line Sanitary Sewers, $25,000. H. Gravencamp, city engr. Noted May 7.

N. J., Hackensack—Hackensack Valley Sewage Comn., trunk line sewer through Hackensack Valley area, $25,000. **Maturity probably soon.** S. W. McClave, Jr., 600 Gorge Rd., Cliffside, engr. G. W. Fuller, 170 Bway., New York, consult. engr.

N. J., Little Falls—Twp. Com., Township Hall, storm water drain in Stevens Ave, $25,000. P. S. Boughton, 843 Broad St., Newark, twp. engr.

N. Y., Ardsley—Village bids late in July, sewerage system of connect with trunk sewers, $150,000. Noted Apr. 30.

R. I., Providence — City sewerage works in Winthrop Ave., Dome, Malbone, Rockingham, Salter and Suffolk Sts. $25,000-$30,000.

Tex., Gladewater—See "Waterworks."

Tex., Overton—See "Waterworks."

Va., Norfolk—City Council sewer in Fairmont Park Sect. Address Director Pub. Works, Municipal Bldg.

Wis., Milwaukee—Sewerage Comn. soon takes bids dock, dredging and cofferdam in connection with extending sewage disposal plant. $400,000. J. L. Ferebee, ch. engr.

BIDS ASKED

Ala., Tuscaloosa — July 14, by Bd. City Comrs., N. Harris, pres. Bd., 71,484 lin.ft. 12- to 30-in. sewer pipe, 379 lin.ft. 12 and 21 in. sewer pipe under railroads, 801 lin.ft. 8- to 24-in. c.i. pipe, 70 manholes, c.i. tees, valves, 10 acres clearing and grubbing.

Ark., Dumas — June 25, by Comrs. Sewer Dist. 1, Merchants & Farmers Bank Bldg., 41,363 ft. 6- to 15-in. sanitary sewers, 5,156 ft. 15 and 18 in. storm sewers, 2 sewerage lifting stations, sewage dispoal plant. $45,000. F. R. Allen, Arkansas Natural Gas Bldg., Pine Bluff, engr.

Conn., Hamden (br. New Haven)—June 22, by town, sanitary sewer in Spring Glen. F. W. Wright, Town Hall, engr. Noted May 21.

Ind., Ft. Wayne—June 24, by Dpt. P. Wks., City Hall, 2 sludge removal mechanisms to be of type supported from steel truss spanning tank, driven through central vertical shaft. Contr. 4, f.o.b. cars Three Rivers Sta., for clarification tanks, said tanks to be 84 sq.ft. at top of sidewalls, 84 ft. diam. at bottom side walls with corners filled in, said walls to be 16 ft. 8 in. high, 15 ft. normal water depth. Decker, Shoecraft & Drury, State Savings Bank Bldg., Ann Arbor, Mich., consult. engrs.

Kan., Wichita—July 2, by C. C. Ellis, city clk., primary sewage treatment plant, incl. 20,000 cu.yd. excav., 75,000 cu.yd. additional fill, 9,000 cu.yd. rein.-con., screening and pumping station, aeration tank, sludge digestion tanks. Former bids rejected. Bids of June 4 on gas holder, sewage pump and switchboard being considered. Black & Veatch, 700 Mutual Bldg., Kansas City, Mo., engrs. Noted May 28.

Ky., Louisville—June 26, by Commissioners of Sewerage, Marion E. Taylor Bldg., sewers, manholes, incl. 1,430 ft. 30 in. (at mouth) in Beargrass Ave., 1,575 ft. 51 in. (at mouth) in Brookline Ave., 1,330 ft. 31 in. (at mouth) in Lynhurst Ave. $40,000. J. M. Kaye, c/o owner, engr.; adv. E. N.-R. June 18.

Mass., Boston — June 19, by Dpt. P. Wks., J. A. Rourke, comr., sewerage works in Kenmore Rd., Dorchester, $25,000.

Mo., St. Louis—See "Contracts Awarded."

New Jersey—July 16, by Joint Meeting Cities of East Orange, Newark, and Summit, Twps. of Hillside, Maplewood, Millburn, and Union, Boro of Roselle Park, Village of South Orange and Towns of West Orange and Irvington, City Hall, Newark, constructing Divs. A, B, C, and D, Contr. "D", in Elizabeth. A. Potter, 50 Church St., New York, ch. engr.; adv. E.N.-R. June 18.

N. Y., St. George—June 24, by J. A. Lynch, pres. Richmond Boro, Boro Hall, sanitary sewers in Steel Ave.; resurfacing, placing cinders on dirt roadways Burbank Ave., etc.

Pa., Phila.—July 1, by Dpt. P. Wks., Bureau Eng. & Surveys, City Hall Annex, A. Murdock, dir., Schedule A, main sewer in Lakeside Ave.; Schedule B, sewage disposal project, Somerset Lower Level Collecting Sewer across city property in Castor and Delaware Aves., Casper, Bath, Allen, Ann and Melvale Sts.

Wash., Seattle—Bd. P. Wks. bids about July 25, intercepting sewer in Ballard Dist., 38th Ave. S. W. $612,000. R. H. Thomson, city engr.

Wis., Grafton — June 22, by R. P. Zaun, village clk., caisson well, pump house, pumping machinery, motors, controls, sewage clarifier mechanism, sewage digester mechanism. P. Clark, Appleton, engr.

CONTRACTS AWARDED

Ariz., Phoenix—City Comrs., sewage disposal plant, to Phoenix-Tempe Stone Co., Phoenix, $493,771; trunk sewer, to Gogo & Rados, Los Angeles, Calif., $330,391; lateral sewers, to Hayner & Burns, Las Cruses, N. M., $32,242. Grand total $856,404. Est. $817,000.

Calif., Westmoreland—Westmoreland Sanitary Dist., sanitary sewerage system, to F. W. and W. C. Secombe, 242 East 4th St., San Bernardino, $23,705. Noted Nov. 13.

Conn., Hartford — Metropolitan Dist., Bd. Contr. & Supply, R. Dillon, clk., 5,600 lin.ft. 8 and 10 in. sewers in Princeton, Harvard, Mountain, Forster, Abbot, Freeman and Cumberland Sts., to Bernardinio & Monochio, 80 Franklin St. Est. $25,000. Noted May 21.

Conn., Newtown—H. B. Senior, chn. Building Comn., c/o State Water Comn., State Capitol, Hartford, sewer pipe, sludge beds, filter beds, Imhoff cement tanks and appurtenances for sewage disposal plant at State Insane Asylum, to T. J. Connor Constr. Co., 441 Arctic St., Bridgeport, $67,980. Noted May 28.

Ill., Downers Grove—Bd. Trustees Downers Grove Sanitary Dist. DuPage Co., enlarging sewage treatment works, to Thorgersen & Ericksen Co., Downers Grove, $97,762. Noted Apr. 23.

Ill., Westchester—Village, sewer and water stubs, to G. Harding, 3139 Indiana Ave., $21,074. Est. $39,800. Noted May 21.

Kan., Topeka—Wet and dry well, consisting circular section 27 ft. diam., 30 ft. deep for sewage lift station in Dist. 93, to C. A. Ritchie, 1600 McVicker St., $8,000. Bids on superstructure and machinery later. W. E. Baldry, City Hall, engr. Noted May 7.

Md., Baltimore—Bd. Awards, constructing sub-structure for mechanical screen building and connecting conduits at Back River Treatment Wks., Contr. 275, to Marocco Contg. Co., 231 South Exeter St. $54,305.

Mich., Highland Park—For 1 mi. 4 ft. brick, concrete sewer, with brick, concrete manholes, part open cut and part tunnel construction, 3rd Ave. from Six Mile Rd. to Detroit Terminal Ry. $40,000. L. C. Whitsit, 19 Gerald Ave., engr.

Mo., St. Louis—Reconstructing, repairing Vandeventer Ave. and Rocky Branch Sewers, day labor. $98,628. Private plans. Noted Feb. 19.

Neb., Omaha—City, District Sewer 1084, to J. J. Hanighen Co., 617 South 14th St., $74,582; Storm Sewer 1087, Plant St., to Humphreys Bros., 4680 Leavenworth St., $38,953.

N. J., Clifton—Passaic Co., Court House, Paterson, storm water drains in Wabash Ave., to Gerritsen Constr. Co., 40 Sidney St., Lodi. Est. $25,000.

N. Y., Brooklyn — H. Hesterberg, pres. Brooklyn Boro, Boro Hall, sewers in Glenwood Rd., to Matarazzo & Yondola, $13,043; in East 26th St., to E. Meluccio, 1209 61st St., $4,938. Noted May 28.

N. Y., Long Island City—G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., sewers in 62nd Dr., to Russell Contg. Co., 8502 91st Ave., Woodhaven, $99,248; Horace Harding Blvd. to Kennedy & Smith, Inc., Bradford Ave., Flushing, $8,738; 146th Ave. to Mannino & Pittari, 283 86th St., Brooklyn, $6,401. Grand total $114,387. Noted May 28.

N. Y., New York — Sanitary Comn., W. Schroeder, Jr., chn., Municipal Bldg., dock, sea wall along east shore Ward's Island connecting with sewage treatment works, to Fred Snare Corp., 114 Liberty St., $588,817. Noted May 7.

N. Y., New York—H. Bruckner, pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., sewers in Tiemann Ave., to Nabrum, Inc., 2666 Wallace Ave., $272,015; in Seneca Ave., to A. Caserta, 2442 Barnes Ave., $1,140. Noted June 4.

O., Cleveland—City, Big Creek Intercepting Sewer Bellair Rd., Contr. 1, to Middle West Constr. Co., Leader Bldg., $43,159; Walworth Run Diversion Sewer, to D. Nero, 1424 Lakeview Rd., $21,510. Noted May 21.

Pa., Willow Grove—Bd. Comrs. Upper Moreland Twp., laying 5.5 mi. 8- to 24-in. vitr. and 1.1 mi. 8- to 18-in. c.i. sewers, to Tony Pietro, Glenside, $127,514.

S. D., Huron — Sewage disposal plant, to Huron Constr. Co., Huron, $165,000. Noted May 7.

Tex., Childress — City, c/o Clerk, Clayton, N. M., constructing Sanitary Sewer Dist. 1, to Jordan Hall Constr. Co., Plainview, and W. Hale, Childress. Est. $118,971. Former contractor defaulted.

Que., Montreal—City, Sewerage Div., P. Wks. Dpt., sewers in Van Horne and Hochelaga Sts., to Frank Lapan Ltd., 901 Lacordaire St., $18,021 and $7,067 respectively; Hamelin St., to Dante Constr. Co. Ltd., 6844 St. Lawrence St., $4,184; Western St., to C. Perluzzi, 9300 Lajeunesse St., $15,209. Grand total $44,481.

WASTE DISPOSAL

PROPOSED WORK

N. J., Irvington (br. Newark)—Town Council, Town Hall, municipal refuse incinerator addition, $160,000. **Maturity probably in September.** Project in abeyance. Noted May 21.

N. J., River Edge—Bd. Boro Council, Boro Hall, municipal incinerator, $25,000. **Maturity probably soon.** Engineer not selected.

BRIDGES

PROPOSED WORK

California—Bd. Supervs. Yolo Co. (Woodland) and Sacramento Co. (Sacramento) and Sacramento Northern R.R. Co., Sacramento, H. O. Brown, ch. engr., Sacramento, surveys new bridge over Sutter Slough in Supervisor Marts Dist., $130,000 or more.

Calif., Los Angeles—Bd. Comrs. Los Angeles Co., thirteen 40 ft. spans, concrete, steel bridge over Los Angeles River on Vernon-Downey Rd. W. D. Armstrong, Los Angeles, co. bridge engr.

Calif., San Francisco—S. J. Hester, secy. Bd. P. Wks., City Hall, will take new bids bridge over channel at 3rd St., for City, San Francisco Co. and California State Bd. of Harbor Comrs. Former contract rescinded. Noted June 4.

N. J., Bound Brook—Bd. Freeholders Somerset Co. (Somerville) and Middlesex Co. (New Brunswick) preliminary plans concrete, steel bridge over Green Brook, East Main St., $45,000. O. Smith, Court House, Somerville, engr. former and W. Buchanan, 175 Smith St., Perth Amboy, engr. latter counties. Noted June 11.

N. J., Newark—Bd. Freeholders Essex Co., Hall of Records, Bldg., preliminary plans steel concrete bridge, Berkely St. $25,000 W. Stickles, Hall of Records Bldg., co. engr.

N. D., Elbowoods—State Hy. Dpt., Bismarck, steel, concrete bridge over Missouri River, near here. $400,000.

Okla., Shattuck—State Hy. Dpt., Oklahoma City, preliminary plans 8 span 124 ft. rein.-con. bridge Ellis Co. $25,000. A. R. Losh, hy. engr.

Texas—State Hy. Comn., W. R. Ely, chn., Austin, 12 concrete, steel, treated timber pile bridges on Hy. 43, Federal Aid Project 582-C, Robertson Co., $50,000; rein.-con. bridge over Comanche Creek, Hy. 9, Mason Co., $50,000. G. G. Wickline, Austin, bridge engr.

BIDS ASKED

California—July 1, by C. H. Purcell, engr. State Hy. Comn., Sacramento, rein.-con. girder bridge to have six 34 ft. spans on concrete pile bents, concrete abutments, wing walls on pile founds., over Coyote Creek, Santa Clara Co.

California—See "Streets and Roads."

Calif., Los Angeles—June 29, by Bd. Comrs. Los Angeles Co., three 60 ft. span structural redwood or Douglas fir Howe truss type bridge, 30 ft. wide over San Gabriel River, at Carson St.

Idaho—June 23, by A. Harbour, comr. P. Wks., Boise, bridge, approaches over Pack River, Bonner Co. H. T. Evans, Coeur d'Alene, dist. engr.

Ill., East St. Louis—July 6, by Bd. Trustees East Levee & Sanitary Dist., 217 Metropolitan Bldg., two 65 ft. and one 130 ft. span rein.-con. steel bridge over Construction Project 8, also double 10 x 5½ ft. rein.-con. culvert, 90 ft. long, State Route 39. E. F. Harper c/o owner, ch. engr. This corrects report in June 4 issue.

Ia., Dubuque—See "Streets and Roads."

Mass., Boston—June 24, by Dpt. P. Wks., steel, concrete foot bridge over New York, New Haven & Hartford R.R. and Dorchester Rapid Transit, Dorchester. J. A. Rourke, Dpt. P. Wks., Boston, comr.

Missouri—June 26, by State Hy. Bd., Jefferson City, bridges in Carroll, Cole, Dunklin, Jasper, Newton, Oregon, Platte, Texas and Warren Counties. T. H. Cutler, Jefferson City, state hy. engr.

N. J., Belvidere—July 8, by Bd. Freeholders Warren Co., Court House, grading 9 m. rein.-con. paving 52,457 sq.yd. State Hy. R. 8, Sect. 7, from Woodpecker Point to Hainesburg. Knowlton Twp. H. W. Vedder, Court House, co. engr.

N. J., Rahway — June 22, by Bd. Freeholders Union Co., Court House, Elizabeth, constructing abutments, abutment extensions, wing walls, wing wall extensions, concrete railings, new timber flooring, grading, paving approaches over Rahway Ave., River at Meadow Ave. $25,000. R. Collins, Court House, Elizabeth, co. engr. Noted Jan. 29.

New York—July 7, by A. O. Smith, hy. supt. at office Bd. Supervs. Suffolk Co., Riverhead, substructures Shelter Island-Sag Harbor Bridge, near Sag Harbor, and Shelter Island-Greenport Bridge, near Greenport. Robinson & Steinman, 117 Liberty St., New York, consult. engrs.; adv. E.N.-R. June 18. Noted June 4.

N. Y., Long Island City — June 24, by A. Goldman, comr., Plant & Structures, Municipal Bldg., New York, reconstructing centre pier fender of Grand Street Bridge over Newtown Creek.

N. Y., New York—June 24, by A. Goldman, comr. Plant & Structures, Municipal Bldg., partial reconstruction centre pier fender of Macombs Dam Bridge over Harlem River; furnishing, installing passenger elevator in south tower Manhattan Anchor Pier, Queensboro Bridge, 59th St. east of 1st Ave.

Ohio—June 19, by O. W. Merrell, dir. hys., Columbus, 110 ft. span rein.-con. arch bridge, 24 ft. roadway, approaches, Sect. "K" North Kingsville-South Rd., Ashtabula Co., $48,784; three 60 ft. span concrete beam bridge, 24 ft. roadway, approaches, Sect. "A" and "B" West Unity-Montpelier Rd., Fulton Co., $42,796.

Pennsylvania—See "Streets and Roads."

Pa., McKees Rocks — June 23, by R. G. Woodside, controller Allegheny Co., Pittsburgh. McKees Rocks Bridge, incl. additional Pylon and sculptural work on main pylons. $50,000. C. R. Covell County Bldg., Pittsburgh, engr.

Pa., Pittsburgh—See "Streets and Roads."

Tex., Caldwell—Caldwell Co. (Lockhart) taking bids 230 ft. vehicular bridge, 24 ft., rein.-con. substructure, timber or concrete flooring, precast stone or steel balustrades on Main Hy.

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Bridges (Continued)

near here. $70,000. Address County Engineering Dpt., Lockhart.

West Virginia—See "Streets and Roads."

CONTRACTS AWARDED

Arkansas—State Hy. Dpt., Little Rock, ten 33 ft. and two 20 ft. span I-beam and slab bridge, concrete piling, between Nettleton and Truman. Job 10170. Craighead Co., to W. L. Sharpe, 3522 Midland St., Memphis, Tenn., $22,082. Est. $27,660.

Calif., Montalvo—C. H. Purcell, engr. State Hy. Comn., Sacramento, steel plate girder bridge, to have twenty-one 86 ft. spans on concrete piers, abutments, 42 ft. roadway, 5 ft. sidewalks over Santa Clara River, 1 mi. south of here, to Mittry Bros. Constr. Co., Detwiler Bldg., Los Angeles, $282,303. Noted May 14.

Indiana—State Hy. Comn., Indianapolis, 150 ft. steel truss bridge, Parke Co., to Natl. Concrete Co., 1017 Lemcke Bldg., Indianapolis, $19,701 est. $26,646—two 60 ft. steel, concrete bridges, Pulaski Co., to J. A. Crosbie, Bluffton, $21,672 est. $27,665—bridge to have four 40 ft. rein.-con. girder and one 106 ft. steel girder spans, Laporte Co., to McGrath Constr. Co., Naperville, $46,163 est. $67,389. Grand total $87,536. Noted May 21.

Iowa—State Hy. Comn., Ames, 32 culverts, extensions, Clay Co., to Christenson Bros., Tyler, Minn., $11,979—55 culverts, Jackson Co., to L. Peterson, Cedar Rapids, $17,792—70 x 24 ft. plate girder bridge, 1 culvert, Scott Co. and grade crossing, incl. five 52 x 44 ft. I-beam spans, Marion Co., to Ben Cole & Son, Ames, $9,940 and $17,560 respectively. Grand total $64,246. Noted June 4.

Kansas—State Hy. Comn., Court House, Fredonia, two 30 ft. deck girder, one 130 ft. and two 80 ft. concrete arch span bridge, Project 75-7, Federal Aid Project 43-F, Wilson Co., to F. K. Ketler Co., 105 West Monroe St., Chicago, Ill., $78,742. Awarded Apr. 30.

Kentucky — State Hy. Dpt., Frankfort, concrete substructure, bridge over Kentucky River, at Gratz, Henry and Owen Counties, to Steel & Lebby, Holston Bank Bldg., Knoxville, Tenn., $40,061; steel bents, superstructure for same, to Vincennes Bridge Co., Vincennes, Ind., $64,419. Noted Apr. 30, under "Streets and Roads."

Maine — State Hy. Dpt., Augusta, to J. A. Greenleaf & Sons, Auburn, concrete bridges in Wales, $3,246—West Gardner, $6,102; Litchfield, $15,901; Monmouth, $6,102—to Standard Engr. & Constr. Co., 2463 Bway., Toledo, O., steel superstructure bridge Palermo, $8,677—to W. V. Mitten, Augusta, bridge Palermo, $10,693 — to J. Fredericks, Pittsfield, bridge, Palmyra, $2,878 — to Bradley & Linscott, Corinth, bridge, Standish, $4,123—to Wyman & Simpson, Augusta, bridge China, $3,594. Grand total $61,316. Noted May 14.

Mass., Hinsdale—Dpt. P. Wks., State House, Boston, A. W. Dean, engr., 1,821 ft. steel plate girder bridge over Boston & Albany R.R. with 520 ft. bituminous macadam and gravel approach, to Lee Constr. Co., 133 Southampton St., Boston, for Commonwealth of Massachusetts. Dpt. P. Wks., Boston. $61,621. Noted May 28.

Mich., Marshall—Calhoun Co. Road Comn., Br. 1 of 13-10-31 and Br. 2 of 13-10-31, each having 2 semi-gravity abutments, steel deck girders, 22 ft. roadways and two 2½ ft. sidewalks, to Grove Constr. Co., Battle Creek, $19,041; structural steel, to Whitehead & Kales, Detroit, $5,129. Noted May 20 Daily.

Nebraska—Dpt. P. Wks., Lincoln, three 16 ft. concrete slab span and two 16 ft. concrete slab span bridges on Lincoln-Beatrice Rd., Project 18, Div. 1, Lancaster Co., to G. E. Smith, Lincoln, $4,559—corrugataed culvert pipe, to Superior Road Supply Co., 1106 Nicholas St., Omaha, $3,665—three 30 ft. steel girder span bridge, to Central Bridge & Constr. Co., Wahoo, $9,278—3 concrete slab span bridges on McCook-Culbertson Rd., to Wickham Bridge & Pipe Co., Council Bluffs, Ia., $13,723, all forgoing Red Willow Co. Grand total $31,225.

N. J., Freehold—Monmouth Co., Court House, concrete, steel bridge on Allentown-New Egypt Rd., to S. S. Thompson & Co., Inc., Red Bank. Est. $25,000. Noted May 29 Daily.

N. J., Paramus—State Hy. Comn., Trenton, bridge to carry Route 2, Sect. 6 over Route 4, Paramus Boro, Bergen Co., to Anderson Constr. Co., 391 Hoyt St., West New York, $55,458. Noted May 28.

N. Y., Collins—Bd. Supervs, Erie Co., Ellicott Sq., Buffalo, 3 span 24 x 100 ft. deck girder type over Clear Creek, on Jennings Rd., to A. K. Van Ingen, Lake St., Hamburg, $38,519. Noted June 11.

Ohio—O. W. Merrell, dir. hys., Columbus, three 6 ft. span concrete beam bridge, 25 ft. roadway, two 2½ ft. sidewalks, Lake Co., to J. Clark, 808 East 250th St., Noble, $35,101—45 ft. span concrete beam bridge, 24 ft. roadway, two 3 ft. sidewalks, Mercer Co., and two 25 ft. span concrete slab bridge, 24 ft. roadway, Sandusky Co., to M. L. Jones, Kansas, $7,303 and $11,980 respectively—23 ft. span concrete slab bridge, 29 ft. roadway, Butler Co., to W. G. Branson Co., 633 Woodrow Ave., Columbus, $6,029—five 97 ft. span concrete arch bridge, 10 ft. roadway, two 6½ ft. sidewalks, approaches, Montgomery Co., to Maxon Constr. Co., Inc., 614 Callahan Bank Bldg., Dayton, $207,873. Grand total $268,886. Noted June 4.

Oklahoma—State Hy. Dpt., Oklahoma City, 8 span 124 ft. rein.-con. bridge at Atoka, Atoka Co., to J. W. Hopper, Wilburton, $21,075 est. $25,000—8 span 118 ft. rein.-con. bridge at

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Chandler, Lincoln Co., to Southwestern Bridge & Culvert Co., Hales Bldg., Oklahoma City, $23,178 est. $25,000—1 span 80 ft. steel truss bridge on concrete piers at Chelsea, Rogers Co., to Gaines-Yuekum, 5191 West Main St., $22,979 est. $25,000. Grand total $67,232.

Pa., Ligonier—Bd. Supervs, Ligonier Twp., two 30 ft. span bridge, 24 ft. roadway over Mill Creek, to Ligonier Constr. Co., Ligonier, $11,000. Noted May 21.

Rhode Island—State Bd. P. Roads, Providence, Bridge 257, 3 span, rein.-con., Coventry, to J. M. Kelley Constr. Co., New Haven, Conn., $22,233—Bridge 269, concrete arch, to Luten Bros. Bridge Co., Inc., Loew Bldg., Syracuse, N. Y., $15,000—widening Bridge 134, East Providence, to H. M. Soule, Pawtucket, $6,900. Grand total $44,133. Noted May 7.

Virginia—See "Streets and Roads."

Wis., LaCrosse — State Hy. Comn., Court House, Lagoon and Gunderson Bridges, to R. G. Hase, Spring Green, $19,183. Noted May 14.

Ont., Becher—Lambton Co., steel, concrete bridge over Sydenham River, steel to Canadian Bridge Co., Walkerville, $15,225; sub-structure, to A. Kirkpatrick, Petrolia, $6,720. Noted Dec. 18.

Ont., Galt—For 250 to 300 ft. new concrete or concrete, steel bridge over Grand River, Main St. $100,000. D. T. Black, City Hall, engr.

Que., Chicoutimi—Bridge, to D. Desandis, Chicoutimi, $39,600.

Que., Ste. Germaine — Municipality, bridge over Lake Etchemin outlet, to Joseph Carrier & Mercier, St. Magloire, $32,500.

STREETS AND ROADS

BIDS ASKED

California—June 24, by State Hy. Comn., Sacramento, bituminous treated gravel surfacing 8.4 mi. road between Big Lagoon and Freshwater Lagoon, Humboldt Co.—20 mi. road between Airport and Soda Springs, Placer and Nevada Counties—grading, screened gravel surfacing 2.3 mi. road between Dry Creek Bridge and Christine, also constructing timber bridge, Mendocino Co. — 127 ft. open spandrel arch bridge, incl. two 44 ft. and two 36 ft. girder spans over Granite Creek, south of Monterey, Monterey Co. — widening multiple span arch bridge over Santa Ana River, near Riverside, incl. constructing two 95 ft., two 102 ft. and one 106 ft. spans on concrete piers, abutments, pile found., Riverside Co. C. H. Purcell, engr.

Calif., Sierra Madre—June 24, by City Council, 3 in. asphaltic concrete paving 125,000 sq.ft. Woodland Dr., et al., also retaining wall, storm drains.

Indiana—June 23, by J. J. Brown, dir. State Hy. Comn., Indianapolis, bituminous retread, puddled macadam or bituminous coated aggregate surfacing 23,061 mi. State Rd. 29 from Madison to Versailles, Federal Aid Project 280-A and B, Contr. 148, Jefferson and Ripley Counties—2.73 mi. State Rd. 9 from Woolcottville north, Contr. 152, La Grange Co.—grading, drainage structures 3.399 mi. State Rd. 69 from New Harmony south, Contr. 149, Posey Co.

Ind., Evansville—June 22, by Bd. Comrs. Vanderburgh Co., concrete surfacing Olmsted Avenue Rd., $20,495. E. D. Koeneman, Evansville, co. aud.

Ind., Evansville—July 2, by Bd. Comrs. Vanderburgh Co., asphaltic concrete surfacing T. J. Grimm Rd., $61,430—Robert F. Heinlin Rd., $24,806—concrete surfacing Carrie Georget Rd., $9,590. E. D. Koeneman, Evansville, co. aud.

Ind., Kentland—July 6, by Bd. Comrs. Newton Co., macadam surfacing Andrew T. Benson, Roy Smart and Walter Sorenson Rds. $38,142. C. H. Adamson, Kentland, co. aud.

Ind., Laporte—June 29, by Bd. Comrs. St. Joseph Co., concrete surfacing William Swank Rd., $48,482. R. W. Leets, Laporte, co. aud.

Ind., Terre Haute—June 29, by Bd. Comrs. Vigo Co., vitr. brick surfacing John Gilhan Rd. $33,069. C. C. Pinson, Terre Haute, co. aud.

Ind., Terre Haute—June 29, by Bd. Comrs. Vigo Co., vitr. brick surfacing Samuel Tindall Rd., $33,000. C. C. Pinson, Terre Haute, co. aud.

Ind., Versailles—June 22, by Bd. Comrs. Ripley Co., concrete surfacing George Bruce Rd. $21,827. H. L. Akers, Versailles, co. aud.

Ind., Warsaw — June 27, by Bd. Comrs. Kosciusko Co., macadam surfacing 4.19 mi. P. D. McFarren Rd., $18,920; 2.93 mi. John M. Stinson Rd., $15,051. H. B. Helvey, Warsaw, co. aud.

Ia., Dubuque — June 23, at office Auditor Dubuque Co., grading 11.2 mi. County Trunk Rd. G, also 14 items culverts, bridges.

Ia., Webster City—June 22, at office Auditor Hamilton Co., gravel surfacing 19.25 mi. trunk road—28.25 mi. local road—resurfacing 66.5 mi. trunk road—2 mi. local road.

Kansas—June 26, by State Hy. Comn., Court House, Newton, concrete surfacing 1.723 mi. U. S. Rd. 50, Federal Aid Project 357-C, Harvey Co.; 1.661 mi. same road, Sect. D, both 20 ft. W. V. Buck, Topeka, hy. engr.

Kentucky — June 24, by State Hy. Dept., Frankfort, grading, drainage structures 6.941 mi. Hindman-Lackey Rd., Federal Aid Project 237-AG, 20 and 26 ft., Knott Co. B. Johnson, chn.

Kentucky—July 15, by State Hy. Dpt., Frankfort, grading, drainage structures 7.9 mi. Jackson-Saylersville Rd., Breathitt Co.—6.7 mi. Liberty-Campbellsville Rd., Casey Co.—6.9 mi. Hindman-Lackey Rd., Knott Co.—14.6 mi. Flemingsburg-Morehead Rd., Fleming Co.—6.1 mi. Tompkinsville-Edmonton Rd., Monroe Co.—8 mi. Morehead-Flemingsburg Rd., Rowan Co.—surfacing 2.6 mi. Carrollton—Warsaw Rd., Carroll Co.—7.2 mi. Cecelia-Vertrees Rd., Hardin Co.—11.6 mi. Springfield-Perryville Rd., Washington Co. B. Johnson, chn.

Louisiana — July 14, by State Hy. Comn., Baton Rouge, concrete surfacing roads in Bienville, DeSoto, Red River, and Sabine Parishes. H. B. Henderlite, hy. engr.; adv. E. N.-R. June 18.

Maryland—June 23, by State Roads Comn., Baltimore, G. C. Uhl, chn., grading, drainage structures 5.21 mi. Contr. A-88-64, Allegany Co.— sheet asphalt paving 0.59 mi. Contr. BC-105-72, Baltimore City—gravel surfacing 2.69 mi. Contr. C-43-82, Calvert Co.—concrete paving 4.34 mi. Contr. T-35-22, Talbot Co.; adv. E.N.-R. June 18.

Massachusetts—June 23, by Dpt. P. Wks., State House, Boston, bituminous macadam paving 5,945 ft. hy. Canton—6,950 ft. Needham—3,000 ft. Dighton—gravel and bituminous macadam paving 4,850 ft. Rochester — 5,400 ft. Savoy. A. W. Dean, Dpt. P. Wks., Boston, engr.

Mass., Boston—June 19, by Dpt. P. Wks., sheet asphalt or bitulithic paving streets in Ward 20, and Havana St., Ward 12. $25,000. J. A. Rourke, comr.

Mass., Boston—June 22, by Dpt. P. Wks., J. A. Rourke, comr., sheet asphalt or bitulithic paving Buchanan St., Ward 20. $25,000.

Michigan—June 23, by A. L. Burridge, div. engr., Cadillac, grading, drainage structures 11.842 mi. FO40-11C-1 and FO5-15C-1, Kalkaska and Antrim Counties, for State Hy. Comn., Lansing.

Michigan—June 23, by A. L. Burridge, div. engr., Cadillac, grading, drainage structures 13.612 mi. FO35-12C-3, Iosco Co., for State Hy. Comn., Lansing.

Michigan—June 24, by H. W. Hagaman, 504 Eddy Bldg., Saginaw, div. engr., grading, shaping, drainage structures, concrete paving 0.86 mi. MO76-27C-1 and Assessment Dist. 1144, Shiawassee Co., for State Hy. Comn., Lansing.

Michigan—June 25, by H. G. Oakes, div. engr. Plymouth, grading, drainage structures 4.808 mi, FO38-32, Contr. 1, Jackson Co., for State Hy. Comn., Lansing.

Michigan—June 25, by City Clerk, Niles, grading, shaping, drainage structures, concrete paving 1.561 mi. MO11-31, Contr. 2, FO11-31, Contr. 3, Berrien Co., for State Hy. Comn., Lansing. W. J. Kingscott, Kalamozoo, div. engr.

Minnesota—June 30, by State Hy. Dpt., St. Paul, grading, culverts 14.3 mi. State Project 11-39, Sect. 3—6.9 mi. S. P. 12-38 Sect. 1—38,200 cu.yd. S. P. 64-24, Div. C—18.8 mi. S. P. 64-24, Div. A.

Minn., Duluth—June 22, by Bd. P. Wks., City Hall, asphalt paving. $100,000. J. Wilson, city engr.

Missouri—June 26, by State Hy. Bd., Jefferson City, grading, graveling, concrete paving, chat surfacing roads in Audrain, Benton, Camden, Carroll, Clay, Cole, Cooper, Dunklin, Jasper, Howell, Knox, Lafayette, Linn, Mississippi, Newton, Oregon, Osage, Platte, Texas, Warren and Worth Counties. T. H. Cutler, Jefferson City, state hy. engr.

Mo., St. Louis—July 14, by Bd. P. Serv., City Hall, asphalt paving 23,560 sq.yd. Gravois Ave. from 18th St. to Jefferson Ave., $153,400; 17,270 sq.yd. Gravois Ave. from Jefferson Ave. to Arsenal St., $122,480. W. W. Horner, city engr.

New Jersey — July 6, by State Hy. Comn., Trenton, 9 in. rein.-con. paving 1.164 mi. Route 10, Sect. 2, from Passaic River to Roosevelt Ave., Morris and Essex Counties—furnishing, erecting structural steel for Route 25, Connecting Link, Sects. 4B-5, Kearny, Hudson Co.—constructing ramp connection Route 25, Sect. 7-A, Contr. 50, Newark, Essex Co. A. L. Grover, ch., clk.; adv. E. N.-R. June 18.

New Jersey—July 7, by Bd. Freeholders Sussex Co., County Administration Building, Newton, grading, 9 in. rein.-con. paving 33,668 sq.yd. Route 31, Sect. 9, Andover to Newton. N. B. Anderson, clk.; adv. E.N.-R. June 18.

N. J., Hoboken—June 23, by Bd. City Comrs., City Hall, repairing asphalt pavements on Park Ave., Garden, Hudson, 3rd, Washington, 1st, 2nd, 3rd, 4th, 5th, 6th, 7th, 8th, 9th, 10th, 12th, 13th, Garden, Clinton, Adams, Madison, Jefferson, Jackson, Bloomfield, Grand Sts., etc. $25,000 or more. J. O. Whittemore, city engr.

N. J., West New York—June 23, by Bd. Town Comrs., Municipal Bldg., grading, widening, storm and sanitary sewers, curbing, sidewalks, sheet asphalt on concrete paving Jackson St. $30,000. F. Oleri, 650 Bergenline Ave., engr.

New York—July 7, by A. W. Brandt, comr. Hys., Albany, improving hys. in Columbia, Livingston, Schuyler, Yates, and Nassau Counties; reconstructing hys. in Albany, Erie, Schuyler, St. Lawrence, Suffolk, Tompkins and Westchester Counties; adv. E.N.-R. June 18.

N. Y., New York—June 23, by S. Levy, pres. Manhattan Boro, Municipal Bldg., grading, sheet asphalt on concrete paving York and Columbus Aves., 91st, East 13th, and West 119th Sts.; grading, granite block on concrete repaving Moore, Houston, East 15th, and West 12th Sts.

Ohio—June 19, by O. W. Merrell, dir. hys., Columbus, grading, drainage structures, bituminous macadam, asphalt, concrete or brick paving 87.356 mi. hys. in Allen, Ashland, Ashtabula, Auglaize, Brown, Butler, Coshocton, Crawford, Cuyahoga, Fairfield, Fulton, Greene, Hancock, Henry, Wood, Lorain, Morrow, Mus-

Streets and Roads (Continued)

kingum, Pickaway, Preble, Putnam, Wynadot and Summit Counties. $1,103,840.

O., Bexley (Columbus P. O.)—June 22, by S. W. Roderick, village clk., concrete paving 600 ft. Park Hill Dr. 30 ft., $700—800 ft. alley south of Main St. from Euclaire Ave. to Cassingham Rd., 16 ft., $3,000—asphalt or brick paving 400 ft. Elm Ave. from Remington Rd. to Stanwood Rd., $5,350—1,200 ft. Cassingham Rd. from Fair to Elm Aves., $9,800.

O., Cleveland—June 19, by Bd. Comrs. Cuyahoga Co., integral curbing 4,500 sq.yd. 3 in. brick paving, 10,000 sq.yd. concrete paving, 1,400 tons Kentucky rock asphalt paving, Rockside Rd. from Brecksville to Broadview Rds. $48,577. F. Williams, Court House, engr.

Pennsylvania—June 25, by State Hy. Dpt., Harrisburg, grading, bridges, drainage structures, one course rein.-con. surfacing 5,241 sq.yd. Route 157, Reading Twp., Berks Co.—54,399 sq.yd. full width, 5,695 sq.yd. half width Route 131, Sect. 1, East and West Nottingham Twps., Oxford Boro, Chester Co.—2,353 sq.yd. full width surfacing, incl. fabricating, erecting 70 ft. through plate girder bridge, 30 ft. roadway, 5 ft. sidewalk over Mill Creek, Route 60, Sect. 5, Pine Creek Twp., Jefferson Co.—grading, bridges, drainage structures, bituminous surface treated macadam surfacing 43,359 sq.yd. Route 310, Sect. 2, Bethel and Wayne Twps., Berks and Schuylkill Counties—31,530 sq.yd. Route 316, Sect. 4, Rush Twp., Susquehanna Co.—15,369 sq.yd. full width, 5,729 sq.yd. half width Route 95, Warren Boro, Warren Co.—53,530 sq.yd. Route 332, Chanceford Twp., York Co.—grading, bridges, drainage structures, one course rein-con. full width or bituminous surface treated macadam surfacing 90,967 sq.yd. Route 303, Sect. 1, incl. fabrication, erecting 90 ft. through plate girder bridge, 30 ft. roadway over Little Fishing Creek, Greenwood, Pine, Franklin and Moreland Twps., Columbia and Lycoming Counties — grading, bridges, drainage structures, one course rein.-con., bituminous surface treated macadam or bituminous surface treated macadam on native stone surfacing 77,008 sq.yd. Route 575, Sect. 1 Palmyra and Paupack Twps., Wayne Co. S. S. Lewis, secy.

Pennsylvania—June 26, by State Hy. Dpt., Harrisburg, grading, drainage structures, bridges, one course rein-con. surfacing 67,180 sq.yd. or bituminous treated macadam or bituminous treated macadam on broken stone surfacing 67,686 sq.yd. Route 640, Sect. 2, South Beaver Twp., Beaver Co. — 64,923 sq.yd. Route 107, Sect. 6, Rush Twp., Philipsburg Boro, Centre Co.—46,410 sq.yd. Route 202, Sect. 12, St. Clair Twp., New Florence and Seward Boro, Westmoreland Co.—grading, drainage structures, bituminous surface treated macadam or bituminous surface treated macadam on modified broken stone surfacing 91,551 sq.yd. Route 49, Sects. 1 and 2-6602, Juniata and Allegheny Twps., Bedford and Somerset Counties—grading, drainage structures, bridges, bituminous surface treated macadam surfacing 40,005 sq.yd. Route 261, Sect. 5, Miller and Jackson Twps., Huntingdon Co.—grading, drainage structures, one course rein.-con. surfacing, half width, 13,362 sq.yd. Route 7986-7987 and 8042, Bangor and Roseto Boros, Northampton Co.—grading, bridges, drainage structures, one course rein.-con. surfacing 4,830 sq.yd., bituminous surface treated macadam surfacing 400 sq.yd., rein.-con. wearing surfacing 763 sq.yd. Route 290, P Spur 290, Mahoney Twp., Schuylkill Co.—grading, drainage structures, one course rein.-con. surfacing 4,830 sq.yd. Route 24, Spur 25, Monroe Twp., Snyder Co. S. S. Lewis, secy.

Pa., Phila.—June 30, by Bureau Hys., Dpt. P. Wks., City Hall Annex, A. Murdock, dir., Schedule A, grading 3 streets—Schedule B, asphalt paving (assessment work) 2 streets — Schedule C, vitr. brick paving (assessment work) 1 street—Schedule D, asphalt repaving 2 streets—Schedule E, redressed granite block repaving 2 streets.

Pa., Pittsburgh—June 23, by R. G. Woodside, controller Allegheny Co., retiring 49 buildings, 9 in. concrete paving 3,945 ft. Saw Mill Run Blvd., incl. concrete bridge with horizontal span, $189,500. E. A. Griffith, County Office Bldg., engr.

Texas—June 22, by G. Gilchrist, state hy. engr., Austin, special double bitulithic surface treating 16.92 mi. Hy. 23, Job M-8-U3 and Job M-8-R-3, Callahan and Eastland Counties, 18 ft. $32,000.

Texas—June 22, by G. Gilchrist, state hy. engr., Austin **(F.A.P. means Federal Aid Project and S.A.P. State Aid Project)**, limestone rock asphalt surface course paving 6.618 mi. Hy. 72, S.A.P. 735-C-Unit 2, De Witt Co., $32,000—grading, drainage structures, concrete paving 118,909 sq.yd. Hy. 33, F.A.P. 621-B, Lipscomb Co., $280,000—146,187 sq.yd. Hy. 33, F.A.P. 621-A, Hemphill Co., $380,000—concrete paving 117,704 sq.yd. Hy. 10, F.A.P. 591-C, Unit 2, and County Project 314, Tarrant Co., $200,000—137,628 sq.yd. Hy. 51, S.A.P. 843-A, Unit 2, Hardeman Co., $260,000—56,945 sq.yd. Hy. 81, F.A.P. 440-E, Unit 2, Gonzales Co., $100,000—17,177 mi. Hy. 10, F.A.P. 403-D, and F.A.P. 485-A, Unit 2, Houston and Anderson Counties, $400,000—111,079 sq.yd. Hy. 14, F.A.P. 569-C and D, Unit 2, Navarro Co., $230,000—grading, drainage structures 7.071 mi. Hy. 3, F.A.P. 506-C, Unit 1, Wharton Co., $40,000—7.781 mi. Hy. 40, F.A.P. 556-F, Unit 1, Henderson Co., $100,000—3.92 mi. Hy. 10, F.A.P. 164-reopened, Sect. A, Erath Co., $40,000—8.666 mi. Hy. 70, F.A.P. 96-A, Rev. Sect. A, Unit 1, Fisher Co., $46,000—7.589 mi. Hy. 4, F.A.P. 45, Rev. Sect. C, Unit 1, Hemphill Co., $60,000—15.029 mi. Hy. 118, State Project 970A, Presidio Co., $50,000—5.587 mi. Hy. 106, S.A.P. 890-D, Unit 1, Tyler Co., $40,000—22.537 mi. Hy. 99, S.A.P. 903-B, Unit 1, Pecos Co., $68,000.

Texas—June 23, by G. Gilchrist, state hy. engr., Austin **(F.A.P. means Federal Aid Project and S.A.P. State Aid Project)**, grading drainage structures 14.881 mi. Hy 150, S.A.P. 751, Unit 1, San Jacinto Co., $60,000—8.075 mi. Hy. 106, S.A.P. 697-C, Unit 1, Houston Co., $42,000—13.068 mi. Hy. 1, F.A.P. 558-E, Unit 1, Culberson Co., $66,000—15.089 mi. Hy. 27, F.A.P. 617-A, Unit 1, Crockett Co., $112,000—21.642 mi. Hy. 18, F.A.P. 530-A, Unit 1, Motley Co., $90,000—13.313 mi. Hy. 27, F.A.P. 405, Rev. Sect. B, Unit 1, Kerr Co., $56,000—17.406 mi. Hy. 67, S.A.P. 983, E and F, Erath Co., $120,000—12.969 mi. Hy. 64, F.A.P. 629-A, Unit 1, Van Zandt Co., $80,000—grading, drainage structures, concrete paving 23,350 sq.yd. Hy. 3, S.A.P. 973, Fort Bend Co., $60,000—45,510 sq.yd. Hy. 7 and 137, State Projects 716 and 981-A, Unit 2, Lubbock Co., $90,000—double bituminous on caliche base surface treating 44,680 sq.yd. Hy. 7, F.A.P. 111, reopened, Scurry and Mitchell Counties, $90,000—concrete paving 200,851 sq.yd. Hy. 38, F.A.P. 598-A, Unit 2, Galveston Co., $400,000—100,425 sq.yd. Hy. 22, State Project 902-B, Unit 2, Navarro Co., $200,000—rein.-con. paving 87,498 sq.yd. Hy. 4, S.A.P. 854-B, Unit 2, Cottle Co., $160,000—177,712 sq.yd. Hy. 4, S.A.P. 940, F.A.P. 67 Reopened and Rev. and F.A.P. 573-J, Unit 2, Wheeler Co., $340,000—88,314 sq.yd. Hy. 14, F.A.P. 569-F, Unit 2, Ellis Co., $180,000.

Tex., Beaumont—June 23, by City, c/o P. H. Millard, mgr., rein.-con., natural rock asphalt or duraco on concrete paving 19,000 sq.yd. Madison, Grove and Burt Sts. R. C. Black, Beaumont, engr.

Utah—June 22, by State Rd. Comm., Salt Lake City, grading, bridging, concrete paving 13,000 sq.yd. hy. between North Ogden and Hot Springs, also section road in Brigham City, Weber and Box-elder Counties. H. S. Kerr, Salt Lake City, state engr.

Washington—June 23, by S. J. Humes, dir. Hys., Olympia, grading, ballast material surfacing 1,700 cu.yd. State Rd. 1, Blanchard Bridge Approaches, in Skagit Co. — concrete paving 7.8 mi. State Rd. 3, Prosser to Grandview, F. A. P. 132-I, Benton and Yakima Counties — bituminous (seal coat) surfacing 127 mi. State Rds. 7 and 11—71 mi. State Rd. 3—bituminous surface treating 2.5 mi. Line East—bituminous material road mix on 15 mi. State Rd. 3, all above in Spokane, Lincoln, Adams, Ferry and Stevens Counties—bituminous surfacing 35 mi. Methow Valley Hy., Okanogan Co.

Wash., Kelso—Comrs. Cowlitz Co. bids about July 1, improving 4.5 mi. West Side Hy. from Sandy Bend to Hazel Dell. $58,444. F. C. Cramer, Kelso, engr.

Wash., Mount Vernon—June 30, by Comrs. Skagit Co., grading, draining, graveling 2.7 mi. Lateral Hy. 4. R. E. L. Knapp, Mount Vernon, co. engr.

Wash., Prosser—June 26, by Comrs. Benton Co., bituminous surfacing 9.7 mi. Benton Co. Lateral Hy. 4, Sect. 1. H. J. Straudwold, Prosser, co. engr.

Wash., Seattle—June 29, by Comrs. King Co., Court House, concrete paving 10,401 sq.yd. Evanston Ave. $25,000. T. D. Hunt, Seattle, co. engr.

Wash., Seattle—June 29, by Comrs. King Co., paving 11,707 sq.yd. Issaquah-Monahan Rd.; graveling 4,000 cu.yd. Soos Creek-Berrydale Rd. T. D. Hunt, Seattle, co. engr.

Wash., Seattle—Bd. P. Wks. bids early in July (1st unit) paving 5 mi. Lynn Pl. and Whitman Pl. Approaches to Aurora Ave. Bridge. $331,096. Total $2,125,000. R. H. Thomson, city engr.

Wisconsin—State Hy. Comm. and Hy. Coms. Grand and Crawford Counties, Lancaster, taking bids furnishing, applying 30,000 gal. asphalt Type C, 10,000 gal. heavy bituminous material, and Type E asphalt or Type B tar on roads in Crawford Co.—10,000 gal. Type C asphalt in Grant and Crawford Counties—17,500 gal. heavy bituminous material asphalt Type E asphalt or Type B tar, Grant Co.—37,000 gal. heavy bituminous material Type E asphalt or Type B tar, Grant Co.

Wisconsin—June 23, by State Hy. Comm. and Hy. Coms. Door, Oconto, Shawano and Marinette Counties, Nicolet Bldg., Green Bay, bituminous retread surfacing 282,000 sq.yd. Sturgeon Bay-Sister Bay Rd., S.T.H. 57, S.A.P. 3346, Door Co.—bituminous surfacing 8.25 mi. Lakewood-North Co. line, S.T.H. 32, F.A.P. 339, Oconto Co.—12.7 mi. Keshena-Phlox Rd. 1, S.T.H. 47, S.A.P. 3267, Shawano Co.—10.5 mi. Crivitz-Niagara Rd., U. S. Hy. 141, S.A.P. 3396—12 mi. Pound-Marinette Rd., S.T.H. 64, S.A.P. 3397 — 3 mi. U. S. Hy. 141, all Marinette Co.

Wisconsin—June 23, by State Hy. Comm. and Hy. Coms. Washington, Dodge, and Rock Counties, Madison, grading 1.341 mi. West County Line-Addison Rd., S.T.H. 33, F.A.P. 444-H, Washington Co.—concrete surfacing 4.320 sq.yd. Columbus-Beaver Dam (approaches to Hammer Overhead) U. S. Hy. 151, S.A.P. 1373, Dodge Co.—2,887 sq.yd. Clinton-Darien Rd. (approaches to Barker Overhead), S.T.H. 14, S.A.P. 1378, Rock Co.

Wisconsin—June 26, by State Hy. Comm. and Hy. Coms. Barron and Washburn Counties, Superior, grading, bridging 9.291 mi. Rice Lake-North County line Rd., Barron Co.: grading 14.735 mi. South County Line-Spooner Rd., U. S. Hy. 53, F.A.P. 433-B. Washburn Co.

CONTRACTS AWARDED

Arizona—State Hy. Dpt., Phoenix, clearing grubbing, grading, drainage structures, bridges, sub-surfacing 11.5 mi. Globe-Showlow Rd., Federal Aid Project 99-A, to Lee Moor Constr. Co., Two Republics Bldg., El Paso, Tex., $389,897—grading, drainage structures, bridges, subgrade stabilizer 10.8 mi. same road, Sect. B, to Charles Willis & Son, Inc., 2119 East 25th St., Los Angeles, Calif., $274,024—grading, drainage structures, bridges 4.5 mi. Blythe-Wickenburg Hy., Federal Aid Project 98-E and 11 mi. same road, Sect. F, to Ralph Pleasant, Luhrs Bldg., Phoenix, $83,247 and $144,151 respectively. Grand total $891,319.

Ark., Little Rock — Pulaski Co., grading, drainage structures, asphaltic concrete (Topeka Mix), paving 5.2 mi. Granite Mountain Rd. Impvt. Dist. 47, to C. L. Besler, Hot Springs, $32,669.

California—C. H. Purcell, engr. State Hy. Comm., Sacramento, grading 7.1 mi., 36 to 46 ft., concrete paving 4.9 mi. and bituminous non-skid surfacing balance road between Turner Station and Stockton, San Joaquin Co., to N. M. Ball, Porterville, $195,801—asphaltic concrete widening 21 mi. existing 15 ft. pavement to 20 ft. between East Highland Canal and Sand Hills, Imperial Co., to Griffith Co., Railway Exch. Bldg., Los Angeles, $85,500—3.5 mi. bituminous rock borders on each side 21 mi. road between Yuba City and Biggs, Sutter and Butte Counties, to Jones & King, Hayward, $68,487—heavy fuel oil surfacing 21.1 mi. Mono Co., to Pacific Tank Line Co., Inc., Los Angeles, $6,396—bituminous treated gravel surfacing 2.7 mi. Amador Co., to E. F. Hilliard, 1355 43rd St., Sacramento, $5,508. Grand total $371,772. Noted May 21.

California—C. H. Purcell, engr. State Hy. Comm., Sacramento, bituminous treated rock borders 8.7 mi. road in Yolo and Colusa Counties, to F. W. Nighbert, Bakersfield, $24,141. Noted May 7.

California—State Hy. Comm., Sacramento, grading, bituminous treated crushed gravel surfacing 12.3 mi. road between Yerby and Casa Diablo Hot Springs, 20 and 24 ft., Mono Co., to Macco Constr. Co., Clearwater, $235,097—4.7 mi. Hollister and Pacheco Rds., 22, 24 and 30 ft. San Benito and Santa Clara Counties, and oil treated gravel surfacing 3.2 mi. Priest Valley School Rd., Monterey Co., to Granite Constr. Co., Watsonville, $51,404 and $7,248 respectively—bituminous treatment surfacing 15.5 mi. Murphys-Big Trees Rd., 14 to 16 ft., Calaveras Co., to W. J. Schmidt, Berkeley, $17,065—grading, asphaltic concrete surfacing 2.2 mi. Upland Rd., San Bernardino Co., to Griffith Co., Railway Exch. Bldg., Los Angeles, $99,112. Grand total $409,926. Noted May 21.

Calif., Huntington Beach—City Council, improving Coast Hy., incl. 24,500 cu.yd. imported borrow, 13,435 tons asphaltic concrete base-levelling course Type A, 452 tons asphalt for repaving, to Southwest Paving Co., Washington Bldg., Los Angeles, $62,007.

Calif., Long Beach—City Council, grading, concrete paving 116,850 sq.ft. Pico Ave. between 23rd and Anaheim Sts., to Sully-Miller Contg. Co., 1500 West 7th St., $28,435.

Calif., Richmond—A. C. Faris, city clk., curbing, sidewalks, grading, asphaltic concrete surfacing 10th St. between Dock Ave. and south end 10th St., to Healey-Moore, Inc., 344 High St., Oakland, $29,845.

Calif., San Jose — City Council, curbing, guttering, ornamental street lighting system, widening, paving West Santa Clara St. between Market St. and Los Gatos Creek, to San Jose Paving Co., San Carlos and Dupont Sts., $35,310.

Calif., San Jose — H. Pfeister, clk. Santa Clara Co., 5 in. asphaltic concrete paving 122,500 sq.yd. Alviso-Milpitas Rd., to Union Paving Co., Call Bldg., San Francisco, at $0.178 per ft. Noted May 21.

Idaho — A. Harbor, comr. P. Wks., Boise, grading 4.581 mi. Custer Co., to Lenz, Robertson & Ramsey Co., Gooding, $18,597; oil processing roadbed by road mix method 11.809 mi. Bonneville Co., to W. Hoops, Twin Falls, $27,710 est. $25,279.

Indiana—State Hy. Comm., Indianapolis, grading, drainage structures concrete surfacing 161,334 sq.yd. Rd. 2, Federal Aid Project 244, Porter Co., to Reith-Riley Constr. Co., Goshen, $208,145, Est. $248,779. Noted Apr. 23.

Ind., Cannelton—Perry Co., graveling Badger and Hammerack Rds., to A. H. Lutzgring, Tell City, $14,877 and $9,447 respectively—Hinton Rd., to Cassidy & Sweat, Magnet, $5,298. Grand total $29,652. Noted Mar. 19.

Ind., English—Crawford Co., stone surfacing Jennings Rd., to I. Orwick, Corydon, $14,500; Johnson and Critchfield Rds., to Brown & Cunningham, English, $16,990. Noted Apr. 23.

Ind., Monticello — Bd. Comrs. White Co., stone surfacing Burch and Bissonnette Rds., to Sell Bros., Wolcott, $12,799 and $12,780 respectively.

Ind., South Bend—St. Joseph Co., concrete surfacing Turkey Creek Rd., to W. C. Halstead, 152 Buckingham Dr., $44,457. Est. $75,000. Noted May 14.

Ind., Terre Haute—Vigo Co., concrete surfacing 3,410 ft. R. G. Weber Rd., to Wiley Greenlead, 2032 North 9th St., $13,546 est. $16,244; brick surfacing 15,406 ft. C. N. Smith Rd., to J. A. Shepherd, Terre Haute, $11,242 est. $11,705. Noted May 21.

Iowa — State Hy. Comm., Ames, to Carlson Constr. Co., Marshalltown, grading, drainage structures, paving 30,911 sq.yd. F-218, Clay Co. $46,144—to W. Horrabin Constr. Co., Iowa City, 132,820 sq.yd. P-259, $256,143; 6,936 sq.yd. P-256, $12,514, both Clay Co.—to Bryant Paving Co., Waterloo, 12,114 sq.yd. F-147, $23,464; 19,224 sq.yd. P-748, $44,598, both Clinton Co.; 21,428 sq.yd., Jackson Co. $42,

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Streets and Roads (Continued)

164; 12,904 sq.yd. Scott Co. $43,164 — to Wright Constr. Co., 1325 Main St., Des Moines, 87,900 sq.yd. Dallas Co. $176,433—to Haegg Constr. Co., Cedar Rapids, 6,506 sq.yd. Linn Co. $24,347—to Union Constr. Co., 200 New York St., Des Moines, 139,350 sq.yd. Madison Co. $298,220—to P. Betz, Sioux City, grading, drainage structures 50,816 cu.yd. F. A. 58, Benton Co. $8,117; 516,065 sq.yd. Clinton and Jackson Counties, $77,364; 332,600 cu.yd. P-699, $64,942; 476,000 cu.yd. P-697, $115,679, both Jackson Co.—to H. Porter, Anamosa, 11,290 cu.yd. Delaware Co. $2,349—to Green Constr. Co., Sheldon, 9,657 cu.yd. Clayton Co. $1,988; 10,807 cu.yd. Delaware Co. $2,387—to L. H. Holscher, Victor, 47,973 cu.yd. Benton Co. $12,105—to J. J. Lamereaux, Omaha, Neb., 149,000 cu.yd. Marion Co. $31,901—to McGriff & McManus, New Virginia, 8,778 cu.yd. Warren Co. $2,920—to T. Flynn Constr. Co., Dubuque, gravel surfacing 4,332 cu.yd. Dubuque Co. $6,975. Grand total $1,296,918. Noted June 4.

Ia., Council Bluffs—Pottawattamie Co., grading secondary road system, to E. J. Wilson & Son, Omaha, Neb., $14,884; 11 culverts, one I-beam bridge, to Wickham Bridge & Pipe Co., 1905 West 8way., $16,782.

Ia., Cresco—Bd. Comrs, Howard Co., gravel and re-gravel surfacing 42 mi. trunk and local roads, to Beu & Sons, Sumner, $9,277. Noted May 14.

Ia., Sioux City — Woodbury Co., clearing, grubbing, 9.16 mi. county trunk road, to W. H. Dugan, Omaha, Neb., $31,614; 3 concrete box culverts, to H. Noel, Peterson, $7,985.

Kansas — State Hy. Comn., St. John, bituminous surface mix on 7.328 mi. Stafford Co., to Western Bridge & Constr. Co., 3807 Leavenworth St., Omaha, Neb., $27,158; grading, culverts, concrete surfacing 1.489 mi. Reno Co., 20 ft., to J. H. Shears & Son, Hutchinson, $35,617. Noted May 21.

Kansas—State Hy. Comn., Court House, Dodge City, bituminous surface mix treating 16.062 mi. U. S. Rd. 50S, Federal Aid Project 437-A, Ford Co., to D. H. Hardman, Alton, $56,734.

Kansas—State Hy. Comn., State House, Marysville, grading, culverts 2.293 mi. Kansas Project 32, Federal Aid Project 321-D, Wyandotte Co. to R. G. Aldridge Constr. Co., Kansas City, $41,015; 8.711 mi. Kansas Project 9, Federal Aid Project 435-A, Marshall Co., to A. L. Cook, Ottawa, $67,699, both 30 ft. wide. Noted May 21.

Kansas—State Hy. Comn., Court House, Ellsworth, grading, culverts, concrete surfacing 3.409 mi. U. S. Hy. 40S, Federal Aid Project 436-A, and 11.992 mi. U. S. Hy. 40S, Federal Aid Project 374-E, Ellsworth Co., to Cook & Stucker, Ellsworth, $79,108 and $350,634 respectively.

Kan., Topeka—City Council, 6 in. one course paving 4,580 sq.yd. and 8 in. one course paving 7,930 sq.yd., to Kirkham & Kilmer, 1460 Pembroke Lane, $30,138.

Kentucky—State Hy. Dpt., Frankfort, grading, drainage structures using 1st class double strength vitr. pipe, 5.62 mi. Flemingsburg-Carlisle Rd., Fleming Co., to B. W. Gorham, Lexington, $35,870. Noted Mar. 13.

Kentucky—State Hy. Dpt., Frankfort, grading, drainage structures using corrugated metal pipe 2.189 mi. road in Livingston Co., to K. M. Johnson, Hartsville, Tenn., $25,165—4.084 mi. Breckinridge Co. and grading, drainage structures using rein.-con. pipe, 3.507 mi. Grayson Co., to Hoke Co., Beuchel, $26,828 and $21,003 respectively—1.685 mi. Lyon Co., to Corum Bros., Madisonville, $23,243—light tar and asphalt cut-back surface mix treating 3.479 mi. Harrison Co., to Kaiser Transportation Co., Beuchel, $40,416. Grand total $136,655. Noted Apr. 30.

Kentucky—State Hy. Dpt., Frankfort, grading, drainage structures using rein.-con. pipe 4.136 mi. Olive Hill-Soldiers Rd., Carter Co., to Codell Constr. Co., Winchester, $63,939.

Louisiana—State Hy. Comn., Baton Rouge, grading, drainage structures 14.424 mi. road in Point Coupee Parish, to Dixie Development Co., Alexandria, $77,230 — 10.33 mi. Repides Parish, to Shruptine Constr. Co., Oakdale, $73,418—9.675 mi. Terrebonne and Lafourche Parishes, to Huth Constr. Co., Inc., Franklin, $111,430—14.551 mi. Allen and Jefferson Davis Parishes, to F. D. Harvey & Co., Jonesboro, $55,242—10.197 mi. Iberville and Ascension Parishes, to Carey Constr. Co. Inc., New Orleans, $74,287—13,576 mi. Jefferson Davis Parish, to Midland Constr. Co., Alexandria, $71,476. Grand total $463,083. Noted May 21.

Louisiana—State Hy. Comn., Baton Rouge, asphaltic surfacing 10.522 mi. road in Catahula Parish, to T. L. James & Co., Ruston, $71,685 —14.58 mi. Evangeline Parish, to Flenniken Constr. Co., Shreveport, $80,698—concrete surfacing 10.757 mi. Allen and Jefferson Davis Counties to Barber Bros. Constr. Co., Baton Rouge, $251,260—9.249 mi. Calcasieu and Beauregard Parishes, to Dot. Couch Constr. Co., Dothan, Ala., $230,180 — 15.7 mi. Bossier Parish, to T. S. Clements, Shreveport, $286,228 —4.922 mi. Calcasieu Parish, to Moore Bros., Inc., Lake Charles $129,589. Grand total $1,049,640. Noted May 21.

La., New Orleans—Bd. P. Wks., City Hall, warrenite bitulithic on concrete paving 5,830 sq.yd. Jackson Ave. from Freret St. to South Claiborne Ave., to Craven & Lang, New Orleans Bank Bldg., $26,660; installing 3,373 ft. subsurface drains, manholes, cleanouts, to H. P. and J. F. Egan, New Orleans, $57,330.

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Maryland—State Roads Comn., Baltimore, G. C. Uhl, chn., macadam surfacing 1.76 mi. Contr. H-121-42, Harford Co., to T. B. Gatch Building Corp., Belair Rd., Raspeburg, Baltimore, $29,206; gravel surfacing 1.87 mi. Contr. Ch-105-84, Charles Co., to Pembroke & Gasparovic, Park Hall, $8,290. Noted May 14.

Maryland—State Roads Comn., G. C. Uhl, chn., Baltimore, gravel surfacing 2.1 mi. Contr. Ch-103-84, Charles Co., to Southern Maryland Constr. Co., 18 East Lexington St., Baltimore, $23,323—concrete shoulders 8.26 mi. Contr. Cl-97-511, Carroll Co., to Thomas, Bennett & Hunter, Westminster, $95,770—macadam paving 3.2 mi. Contr. W-91-62, Washington Co., to F. Byron, 638 Regester Ave., Baltimore, $52,893. Grand Total $171,986. Noted May 21.

Maryland — State Roads Comn., Baltimore, G. C. Uhl, chn., macadam resurfacing 0.55 mi. Contr. S-50-14, Somerset Co., to Hanneman-Burroughs Co., Salisbury, $8,186. Noted Apr. 2.

Maryland — State Roads Comn., G. C. Uhl, chn., Baltimore, gravel surfacing 2 mi. Contr. Ch-102-82, Charles Co., to Pembroke & Gasparovic, Park Hall, $14,087. Noted Apr. 23.

Maryland—State Roads Comn., G. C. Uhl, chn., Baltimore, concrete paving 2.24 mi. Contr. H-111-44, Harford Co., to P. Reddington & Son, 2 East Lexington St., Baltimore, $44,328. Noted Apr. 9.

Maryland—State Roads Comn., G. C. Uhl, chn., Baltimore, concrete shoulders on 7.29 mi. Contr. F-173-611, Frederick Co., to M. J. Grove Lime Co., Lime Kiln, $87,743. Noted Mar. 26.

Maryland—State Roads Comn., G. C. Uhl, chn., Baltimore, concrete paving 3.42 mi. Contr. P-169-32, Prince Georges Co., to L. R. Colbert, Fredericksburg, Va., $66,889.

Massachusetts—Dpt. P. Wks., State House, Boston, A. W. Dean, engr., State House, Boston, bituminous macadam paving 4,763 ft. hy. Pembroke, to Eastern Contg. Co., 494 Washington St., Quincy, $18,763—5,600 ft. Great Barrington, to A. G. Bianchi Constr. Co., Inc., 98 Lincoln Park, Longmeadow, $23,050—3,600 ft. Concord, to Greenough Constr. Co., 200 Calvery St., Waltham, $21,976—7,500 ft. Hamilton, to R. G. Watkins & Son, Inc., 47 Main St., Amesbury, $29,342. Grand total $93,131.

Massachusetts—Dpt. P. Wks., State House, Boston, bituminous macadam paving 5,416 ft. hy., Dedham and Westwood, to John Iafolla Constr. Co., 298 East St., Dedham, $28,043.

Massachusetts—Dpt. P. Wks., State House, Boston, bituminous macadam paving 24,411 ft. hy., incl. steel stringer extension to concrete arch bridge, Newbury and Rowley, to M. McDonough Co., Saugus, $211,454. Noted May 21.

Mass., Brookline—Bd. Selectmen, sheet asphalt paving Woodland Rd., to Guaranty Constr. Co., Shirley, $33,119.

Mass., Nantucket—Town, Bd. Selectmen, bituminous macadam paving New St., Monomy Rd., Morey Lane and Ocean Ave., to J. C. Ring, Nantucket. Est. $25,000.

Mass., Newton—City, Dpt. P. Wks., penolithic paving 71,350 sq.yd. streets, to Perini & Ampollini, 242 Waverly St., Framingham, $93,111.

Mass., Westfield—Bd. P. Wks., O. E. Parks, supt., grading, rein.-con. paving North Elm, Court and Broad Sts., to Daniel O'Connell & Sons Co., Inc., 480 Hampden St., Holyoke, $85,627. Noted Apr. 9.

Michigan—H. W. Hagaman, div. engr., 504 Eddy Bldg., Saginaw, grading, shaping, drainage structures, concrete paving 1.306 mi. M056-21C-2, Midland Co., for State Hy. Dpt., Lansing, to J. W. Ederer & Co., Saginaw, $29,750. Noted May 14.

Michigan—W. J. Kingscott, div. engr., 213 Watson Bldg., Grand Rapids, grading, shaping, drainage structures, concrete paving 5.397 mi. M041-21C-2, Kent Co., to Lewis & Frisinger, Ann Arbor, for State Hy. Comn., Lansing, $141,315, incl. cost of cement. Noted May 21.

Minnesota—State Hy. Dpt., St. Paul, grading, culverts, 9.9 mi. S. P. 2-30, Sect. 4, to Barnard-Curtiss Co., 504 Globe Bldg., Minneapolis, $95,493—18.7 mi. S. P. 12-33, S. P. 17-23, to C. Weaver, Anoka, $177,825—10.8 mi. S. P. 14-25, Sect. 2, Div. B, to R. P. England, Mitchell, S. D., $49,215—14.4 mi. S. P. 36-21, Sect. 3, to Strom Constr. Co., Gary, $108,516. Grand total $431,051. Noted May 21.

Mo., Clayton—St. Louis Co., Court House, concrete slab paving 3,267 ft. Airport Rd., to Keeley Bros. Contg. Co., 4301 State St., East St. Louis, Ill., $18,526—5,795 ft. Airport Rd., to W. F. Smith Co., 6635 Delmar Blvd., University City, $56,175; 1,892 ft. Pennsylvania Ave., to W. A. Riley Constr. Co., 6221 Olive St., St. Louis, $22,639. Grand total $97,340. Noted June 4.

Mo., St. Louis—Cyrus Crane Wilmore Organization, Inc., Boatman's Bank Bldg., asphaltic concrete on concrete paving 30 blocks of Neosho, Devonshire, Murdock, Ivanhoe, Murdock, Childress, Prague, Loran and Jamieson Sts., in St. Louis Hills Subdivision, to Bridges Asphalt Paving Co., 1411 Central Industrial St.; curbing, sidewalks, concrete paving alleys, to A. Fleschner, 7055 Winona Ave.; sewers, to R. C. Micotto, 2516 Arlington Ave. Est. $400,000.

Nebraska—State Dpt. P. Wks., Lincoln, concrete paving 3.8 mi. Project 46 and 5.8 mi. Project 68-B, both Red Willow Co., to National Constr. Co., 305 Arthur Bldg., Omaha, $113,632 and $152,846 respectively.

Neb., Omaha — G. Berger, clk. Douglas Co., Court House, grading, curbing, 2½ in. brick on 6 in. concrete paving 11,800 sq.yd. Route 44, Happy Hollow Rd., to Yant Constr. Co., 1146 Omaha Natl. Bank Bldg., $29,389. Noted May 7.

Nevada—State Hy. Comn., Carson City, grading, surfacing 1.32 mi. Clark Co., to General Constr. Corp., Las Vegas, $19,209.

Nevada—State Hy. Comn., Carson City, oil processing roadbed 10.51 mi. Douglas and Ormsby Counties, to Isbell Constr. Co., Carson City, $82,267 est. $92,309—31.44 mi. Elko Co., to A. D. Drumm, Jr., Fallon, $48,583 est. $61,982—23.36 mi. Elk Co., to Utah Constr. Co., Ogden, Utah, $137,171 est. $148,713. Grand total $263,021. Noted May 7.

New Hampshire—State Hy. Dpt., Concord, 6 in. one course rein.-con. on 8 in. gravel base course surfacing 43,441 sq.yd. Rockingham Rd., Londenderry, to Amos D. Bridges Sons, Inc., Hazardville, Conn., $103,006. Est. $110,000. Noted May 28.

N. J., Elizabeth—Bd. Freeholders Union Co., Court House, paving Centennial Ave., Cranford, to Loprete Asphalt Co., 423 Amherst St., East Orange, $122,452. Noted May 27 Daily.

N. J., Flemington—Branchburg and Readington Twp. Comrs., improving road from Harlan to point near Readington, to Richards & Gaston, Somerville, $18,422.

N. J., Flemington — Hunterdon Co., Court House, paving 1.31 mi. Milford-Riegelsville Rd., 20 ft., to Conrad Sebolt, Inc., New Brunswick, $35,604.

N. J., Jersey City—Hudson Co., Court House, stone block surfacing Tonnelee Ave., to Municipal Constr. Corp., 26 Veterans Sq., Jersey City, $64,989. Noted May 21.

N. J., Newark—Bd. Freeholders Essex Co., Hall of Records Bldg., 9 in. rein.-con. paving Swamp Rd.-Dutch Lane Rd., to Franklin Contg. Co., 20 Washington St., $50,221. Est. $60,000.

N. J., Paterson—Bd. City Comrs., City Hall, bituminous macadam paving Bway., to L. A. Cramer, 70 19th Ave., $39,468.

N. J., Westwood—Bd. Freeholders Bergen Co., Court House, Hackensack, sheet asphalt on 6 in. concrete repaving Washington Ave., to W. J. Burns, Prospect St., Oradell, $36,390.

N. Y., Brooklyn—H. Hesterberg, pres. Brooklyn Boro, Boro Hall, to Rennerts Eng. Co., East 12th St., $7,479—to W. J. McHale, 1250 Jefferson Ave., East 29th St., $2,449; Ford St., $1,160; Lenox Rd. $3,635; Rodman St. $2,648; West 13th St. $2,265—to Grimm Contg. Co., 170 McKinley St., Scott Ave., $12,598—to Concrete Co., Metropolitan Ave., Ludlam Pl., $863—to B. Turecamo, New Cropsey Lane, asphalt paving 10th Ave. $20,533; 23rd Ave. $2,806—to D. J. McCoy Asphalt Co., Avenue U and East 57th St., Danforth St. $2,779 — to Pomonok Asphalt Paving & Building Material Co., Sheperd Ave. $4,614—to Brooklyn Alcatraz Asphalt Co., 407 Hamilton Ave., South Elliott Pl. $8,096; Willoughby St. $9,317; 11th Ave. $8,334; 61st St. $5,497 — to Guimont Contg. Co., 1218 Locust St., South 4th St., $10,123—to Ferbon Constr. Co., pipe culvert, $2,868. Grand total $108,064. Noted May 28.

N. Y., Long Island City—G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., to C. Bennett Import. Co., 465 Fenimore St., Brooklyn, grading 54th Ave. $12,408; 35th Ave. $8,632; 136th St. $16,016—to Slattery Contg. Co., 7202 51st St., 34th Ave. $14,997; 97th St. $6,909—to Kennedy & Smith, Bradford Ave., Flushing, 136th St. $6,731—to M. Cafazzo, 1043 36th St., Brooklyn, 115th Ave. $8,790—to Brugel Contg. Co., 1154 Cypress Ave., Ridgewood, Queens Blvd. $9,821—to Carblock Paving Co., Stagg St., Brooklyn, asphalt paving 27th Ave. $5,787; 68th St. $16,972; 115th St. $32,494; Sprague St. $7,351; 61st St. $15,421; 39th Ave. $6,463; 75th St. $9,928—to Sprague Constr. Co., Alameda St., Belle Harbor, Foster Meadow Rd. $85,786—to Borough Asphalt Co., 1301 Metropolitan Ave., Brooklyn, 89th St. $16,956—to D. J. McCoy Asphalt Corp., Ave. U and East 57th St., Brooklyn, $93,903—to Cleveland Trinidad Asphalt Co., Flushing, 14th St. $17,143; Rocky Hill Rd. $41,097; Little Neck Rd. $89,217; Black Stump Rd. $32,210; Queens Ave. $28,635—to Meehan Paving & Constr. Co., 90 West St., New York, Archer Ave. $13,884; 75th St. $10,142—to F. Casadino, 211 North 7th St., Brooklyn, reconstructing bulkhead Beach 19th St. $1,494. Grand total $609,186. Noted May 28.

N. Y., New York—H. Bruckner, pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., asphalt repaving Lyman Pl., to Regan Towers Co., 124 West 121st St., $14,672—asphalt paving Belmont Ave., to Bronx Asphalt Co., Zerega Ave. and Westchester Creek, $4,011—granite block paving Park Ave., to Leonard Paving Co., 233 Bway., $89,210. Grand total $107,893.

N. Y., New York—S. Levy, pres. Manhattan Boro, Municipal Bldg., grading, asphalt paving West 46th and West 40th Sts., to C. D. Beckwith, Inc., Seneca Ave. and Edgewater Rd. $11,137 and $10,649 respectively—East 88th St., to Meehan Paving & Constr. Co., 90 West St., $10,096. Grand total $31,882. Noted May 14.

N. Y., New York—S. Levy, pres. Manhattan Boro, Municipal Bldg., to Meehan Paving & Constr. Co., 90 West St., asphalt paving West 61st St., $14,353; Cannon St. $8,232; granite block repaving Ann St. $7,771—to Triboro Asphalt Co., 368 East 148th St., East 95th St. $12,194—to C. D. Beckwith, Inc., Seneca Ave. and Edgewater Rd., asphalt paving Park Ave. $11,280; University Ave. $38,026—to St. George Paving Co., 415 Lexington Ave., Bond St., $7,450. Grand total $117,307. Noted May 21.

Streets and Roads (Continued)

N. Y., St. George—J. A. Lynch, pres. Richmond Boro. Boro Hall, bituminous concrete paving Guyon Ave., to J. E. Donovan, 2205 Richmond Terrace, Port Richmond, $26,483; grading McFarland Ave., to Laruia Constr. Co., 151 Bway., West New Brighton, $2,234. Noted May 21.

Ohio—O. W. Merrell, dir. hys., Columbus, to Homeberger & Wager Eng. & Constr. Co., 1802 Camp St., Sandusky, concrete paving 1.276 mi. Sect. "J" Cleveland-Sandusky Rd., $26,400; Sect. "V" Milan-Elyria Rd., $62,709, both Lorain Co.; 0.158 mi. Erie Co., $3,800; brick paving, incl. furnishing, delivering brick 5.948 mi. Wayne Co., $132,835—to J. A. Elder, Bryan, concrete paving 1.629 mi. Williams Co., $53,047—to Adams Bros. Constr. Co., Zanesville, 5.35 mi. Licking Co., $122,910—to Trumbull Eng. Co., Warren, 4.829 mi. Trumbull Co., $125,900—to Hollinger-Davidson Co., 85 East Thornton St., Akron, 1.632 mi. Harrison Co., $29,483—to J. Wroe, Dayton Industries Bldg., Dayton, 5.026 mi. Miami Co., $87,128—to J. Clark, 808 East 250th St., Noble, concrete and traffic bound macadam paving 1.844 mi. Lake Co., $76,824—to Highway Constr. Co., 1530 Builders Exch. Bldg., Cleveland, brick paving, incl. furnishing, delivering brick 0.751 mi. Cuyahoga Co., $79,098—to Laughlin Coal & Constr. Co., Canton, 4.596 mi. Carroll Co., $179,066—to W. H. Ringwald & Sons Co., Chillicothe, 3.129 mi. Fairfield Co., $124,180—to A. W. Burns Constr. Co., 424 Woodland Ave., Columbus, 2.76 mi. Ross Co., $74,140—to Costigan-Shroyer Constr. Co., 106 North Main St., Akron, bituminous macadam paving 2.636 mi. Summit Co., $50,615—to T. F. L. Howell, Pearl St., Wapakoneta, 1.487 mi. Auglaize Co., $11,505 — to Dodge-Hussey, Inc., West 5th Ave., Columbus, 1.565 mi. Morgan Co. $61,872—to Fred Walton & Co., 304 South 8th St., Upper Sandusky, rock asphalt paving 0.537 mi. Wyandot Co., $12,244—to B. Francis, Leetonia, tar macadam paving 1.025 mi. Fairfield Co., $15,030—to U. S. Constr. Co., Upper Sandusky, bitulithic surfacing 10.5 mi. Marion Co., $26,788—to Mansfield Asphalt Paving Co., Mansfield, sheet asphalt paving 0.277 mi. Richland Co., $12,959—to Cleveland Trinidad Paving Co., Western Reserve Bldg., Cleveland, bitulithic concrete and brick paving 0.983 mi. Cuyahoga Co., $32,161. Grand total $1,402,685. O. W. Merrell, dir. hys., Columbus, cancelled bids to have been opened June 9, grading, drainage structures, traffic bound macadam paving 1.21 mi. Sect. "C" Chillicothe-Lancaster Rd., Fairfield Co., $36,664. Noted June 4.

O., Youngstown—Paving, drainage 100 ft. boulevard in Forest Lawn Park, to Victor Olson Constr. Co., Mahoning Bank Bldg., $35,000.

O., Cleveland—Cuyahoga Co., grading, concrete curbing, 10 cu.yd. travel-bound macadam paving 4.800 sq.yd. Oakes Rd. No. 3, to J. W. Harris, 14717 Thames Ave., $11,338 est. $22,160; grading, 12 in. two course travel-bound macadam on gravel surfacing 8,350 sq.yd. Chagrin River Rd. No. 2, to Lombardo Bros., Murray Hill Rd., $8,190 est. $20,100.

O., Cleveland—Cuyahoga Co., grading, guttering, sandstone curbing, vitr. brick paving 31,440 sq.yd. Belvoir Blvd. 2, to Bentley Bros., Hanna Bldg., $150,697. Est. $213,900.

Oklahoma—State Hy. Dpt., Oklahoma City, grading, drainage structures 7.33 mi. U. S. Hy. 64 Texas Co., to Alhands & Davis, Joplin, Mo., $29,993 est. $35,000—9.8 mi. U. S. Hy. 64, Beaver Co., to Pharoah & Co., Henryetta, $60,135, est. $70,000—16.28 mi. U. S. Hy. 18, Lincoln Co., to J. J. Harrison, Holdenville, $72,935 est. $80,000, all 32 ft. wide. Grand total $163,063.

Oklahoma—State Hy. Dept., Oklahoma City, grading, drainage structures 9 mi. State Hy. 266 west of Checotah and 9 mi. same road east of Okmulgee Co. line, 32 ft., McIntosh Co., to J. W. Taylor, Konawa, $32,690 and $28,217 respectively, est. $40,000 and $30,000 respectivtgly.

Oklahoma—State Hy. Dpt., Oklahoma City, concrete slab surfacing 6.6 mi. State Hy. 66 west of Bridgeport and 10 mi. same road east of Hydro, both 20 ft., Caddo Co., to Park & Co., 808 East 17th St., Oklahoma City, $56,299 and $145,719 respectively est. $70,000 and $160,000 respectively: 7.6 mi. U. S. Hy. 66 west of Weatherford and 10 mi. same road east of Clinton, both 20 ft. Custer Co., to Ryan & Richards, 1801 East 9th St., Oklahoma City, $113,779 and $145,478 respectively est. $130,000 and $175,000. Grand total $461,275. Noted May 28.

Oregon—State Hy. Comn., Salem, improving 34.62 mi. Lane Co., to McNutt & Pyle, Eugene, $62,070—18.64 mi. Lake Co. to C. R. Johnson, Portland, $62,070, both 18 ft. wide.

Pennsylvania — State Hy. Dpt., Harrisburg, grading, concrete surfacing 73,260 sq.yd. Route 80, Wilmington and East Lackawannak Twps., Mercer Co., to Keystone Paving Co., Inc., Harrisburgh, $199,109; grading, waterbound macadam surfacing 51,181 sq.yd. Route 750, Sect. 1, Cranberry and President Twps., Venango Co., to Hanlon & Oakes, Hadley, $184,169. Noted May 21.

Pennsylvania — State Hy. Dpt., Harrisburg, grading, concrete surfacing 2,384 sq.yd. Route 21, Sect. 2, Richmond Twp., Tioga Co., to Jersey Shore Constr. Co., Jersey Shore, $16,708 — grading, waterbound macadam surfacing 94,827 sq.yd. Route 277, Norwich and Shippen Twps., McKean and Cameron Counties, to A. W. Hinaman, Williamsport, $237,833—60,382 sq.yd. Route 27, Union, Limestone and Jackson Twps., Snyder and Union Counties, to L. H. Hutchison, Orbisonia, $116,403. Grand total $406,944. Noted May 14.

Pa., Charleroi — R. A. Roberts, boro secy., grading, curbing, paving 7th St. and Prospect Ave., to Ross Constr. Co., 830 Brocket St., Pittsburgh, $22,000. Noted May 21.

Pa., Clarion—City, V. E. Ohl, supt. streets City Bldg., curbing, sidewalks, paving 8th and Walnut Sts., to J. W. Butler, 700 Walnut St., McKeesport, $18,917. Est. $25,000.

Pa., Erie—Asphalt paving Aitkin St., to M. A. McCormick, Inc., 1341 Liberty Ave., $15,442; Carolina and Cascade Sts., to J. and M. Doyle, 307 Walnut St., $22,613.

Pa., Munhall—L. Y. Woodward, city secy., Municipal Bldg., grading, curbing, paving numerous streets, to McGrady Constr. Co., 237 4th Ave., Pittsburgh, $247,212.

Pa., Phila.—Bureau Hys., Dpt. P. Wks., City Hall Annex, A. Murdock, dir., to M. Masse, 3936 North Reese St., grading Aramingo St. from Ontario to Tioga Sts. $392—to F. Feraco, 3632 North Lawrence St., Cresheim Rd. from Allens Lane to Emlen St. $2,506—to Municipal Constr. Co., Washington Square Bldg., asphalt paving (assessment work) Bath St. from Victoria to Pacific Sts. and Pacific St. from Allen to Bath Sts., $4,994—to Union Paving Co., Broad and Stiles Sts., Belgrade St. from Venango to Pickwick Sts. $3,758; Edgemont St. from Venango to Pickwick Sts. $3,819; Salmon St. from Pickwick to Castor Sts. $2,305; Stenton St. from Ogontz to Broad Sts. $39,553, asphalt repaving Berks St. from 9th to 11th Sts. $8,980; Walnut St. from 38th to 39th Sts. $7,405—to Barber Asphalt Co., Hunting Park Ave., asphalt paving (assessment work) Mt. Pleasant St. from Forrest to Cheltenham Sts. $23,192; State Rd. from Barton to Cottman Sts. $18,026—to Eastern Asphalt Co., Pennsylvania Bldg., replacing granite block repaving Green Lane from Manayunk to Pechin Sts. $6,953. Grand total $121,883. Noted May 21.

Pa., St. Marys—Boro, C. P. Harvey, secy., grading, curbing, guttering, sewers, rein.-con. paving 8,530 sq.yd. Park, Mill, St. Michael and Oilwell Sts., to J. Weisner & Son, St. Marys, $28,739.

Tennessee—State Dpt., Hys. & P. Wks., Nashville, grading, concrete surfacing 3.962 mi. State Hy. 24, Wilson Co., to W. F. Bowe, Jr., Augusta, Ga., $81,282. Noted May 28.

Tenn., Memphis—D. C. Miller, city clk., removing old curbing, guttering, pavement, 2 trees, old sidewalks, re-curbing, guttering, sewers, water-mains, sidewalks, asphalt on concrete surfacing 19,000 sq.yd. Monroe Avenue Cut-Off from South 2nd St. to Marshall Ave. and 4,200 sq.yd. Monroe Ave. from Front St. to Madison Ave., to F. S. Neely, 669 Maury St., $80,601.

Tex., Corpus Christi — Nueces Co., 1½ in. asphalt on 7 in. rein.-con. toping 3½ mi. Bishop-Petrolilia Rd. and 3½ mi. Old Bronsville Rd., to Cage Bros., Bishop, $27,012 and $26,425 respectively.

Tex., Dallas—Dallas Co., concrete paving Kessler Blvd. from Westmoreland Rd. to Fort Worth Pike, 20 ft., to Central Bitulithic Co., Praetorian Bldg., $87,172.

Tex., Houston—For 2 in. asphalt on 6 in. concrete paving Telephone Rd., to Don Hall, Inc., Union Natl. Bank Bldg., $139,791. Est. $130,000.

Tex., Houston—Harris Co., c/o H. L. Washburn, and., widening La Porte Rd. Underpass, to Gulf Bitulithic Co., 2820 Polk Ave., $28,103.

Utah, Salt Lake City—City Comrs., City Hall, curbing, guttering, 2 in. warrente on 3 in. bituminous paving 2,712 lin.ft. 14 East St. and Logan Ave., to Gibbons & Reed, Continental Bank Bldg., $26,692. Est. $34,128.

Vermont—State Hy. Dpt., Montpelier, grading and base 4.3 mi. hy. Chester, to J. F. Rooney, Milford, Mass., $43,588; 5.31 mi. Coventry and Newport City, to Callan Constr. Co., Bristol, R. I., $77,664. Noted June 4.

Vt., Hartford — State Hy. Dpt., Montpelier, concrete paving 1.8 mi. hy., to E. C. Hayden, Barre, $46,086. Noted June 4.

Virginia — State Hy. Dpt., Richmond, one course macadam surfacing 0.449 mi. road in Smyth Co., to J. A. Archer & Son, Ivanhoe, $10,058—concrete widening 6 mi. Henrico Co., to R. G. Lassiter & Co., Raleigh, N. C., $80,460—gravel surfacing 6 mi. Russell Co., to Longley & Co., Bluefield, W. Va., $13,510—2.5 mi. Henrico Co., to C. S. Luck & Sons, 1617 Brook Rd., Richmond, $16,233—topsoiling 1.07 mi. Charlotte Co., and 3 mi. Buckingham Co., to J. A. Morrow Constr. Co., Inc., Clarksville, $8,145 and $25,428 respectively—5 mi. Bedford Co. and 5.5 mi. Prince Edward and Buckingham Counties, to C. A. Ragland, Louisburg, N. C., $19,163 and $27,021 respectively—slag and gravel surfacing 9.163 mi. Augusta and Rockbridge Counties, to N. L. Teer, Durham, N. C., $24,520—grading, drainage structures 4 mi. Middlesex Co., to R. B. Mitchell, Tappahannock, $8,560—3 mi. Patrick Co., to Marye & Blankenship, Shawsville, $30,544—8 mi. Westmoreland Co., and bridge over Appomattox River, Buckingham and Prince Edward Counties, to Parker-Barnes Constr. Co., Blackstone, $10,047 and $10,694 respectively. Grand total $293,383. Bridge over Roanoke Creek, Charlotte Co., awarded to J. A. Marrow Constr. Co., Clarksville, $13,077, temporarily in abeyance. Noted May 21.

Va., Richmond—Curbing, guttering, to City Building Corp., Builders Exch. Bldg., $21,000—paving alley in West End, to Anderson & Maynard, 3911 Hanover Ave., $1,525 — precast sewer pipe for Forest Lawn Cemetery Road Sewer, to Gray Concrete Co., Richmond, $1,400. Grand total $23,925.

Washington—State Hy. Comn., Olympia, improving 31 mi. Yakima and Klickitat Counties, and 150.5 mi. Benton, Franklin, Walla Walla, Columbia, Garfield and Asotin Counties, to Hargrave Constr. Co., 418 West 20th St., Spokane, $55,816 and $89,358 respectively—crushed stone surfacing 7.54 mi Yakima and Pierce Counties, to I. L. Young, 523 Henry Bldg., Portland, Ore., $66,434—10.3 mi. Pend Oreille Co., to Justin & McAllister, 512 Realty Bldg., Spokane, $23,259—24.7 mi. Benton Co., to F. G. Redmon, 206 South 4th St., Yakima, $26,000—grading 0.045 mi. Whitman Co., to S. G. Morin, 9226 Paulsen Bldg., Spokane, $29,348. Grand total $290,215. Noted May 21.

Wash., Everett—Snohomish Co., grading, paving 1.6 mi. Alderwood Manor Rd., to Pacific Hy. Snohomish Co., to Ervig & Harris, Everett, $31,774. Est. $40,000.

Wash., Mount Vernon — Skagit Co. paving Permanent Hy. 17, to Alexander & McNeil, Mount Vernon, $34,309.

Wash., Olympia—Thurston Co., grading, graveling 3.04 mi. Helsing Junction-Michigan Hill Rd., to Colluccio & Scjoboen, 1642 Lane St., Seattle, $25,130.

West Virginia—State Hy. Comm., Charleston, improving Grantwell-Dolph Rd., Mercer Co., to Hill Co., Inc., Oak Hill, $69,302—Williamson-Island Creek Rd., Mingo Co., to Southern Ohio Quarries Co., Chillicothe, O., $38,393—Reed-Gap-Virginia State Line Rd., Morgan Co., to Parker Constr. Co., Morgantown, $18,288—Lavalette-Wayne Rd., Wayne Co., to Hunt-Forbes Constr. Co., Huntington, $112,530—New Creek Bridge approaches, Mineral Co., to Gilbert Constr. Co., Glen Hedrick, $14,613—3 slab bridges, 4 culverts, Project 2212, Raleigh Co., to Davis & Reynolds, Morgantown, $10,554. Grand total $283,680.

Wisconsin—State Hy. Comm. and Hy. Coms., Manitowoc, Ozaukee, Shawano Counties, Green Bay, grading 3.753 mi. Shawano Co., to A. E. Lynch Co., 1012 North 3rd St., Milwaukee, $53,129—grading, concrete paving 11.582 mi. Shawano Co., to Freemuning Bros., Inc., 2058 Green Bay Ave., Milwaukee, $80,569—4.33 mi. Manitowoc Co., to L. L. Tisdall, Waterford, $92,648—grading, graveling 2.765 mi. Ozaukee Co., to C. E. Lueta, Stamico, $18,966—graveling 11.582 mi. Shawano Co., to W. Winkler & Sons, Greenleaf, $40,273—12.7 mi. Kewhens Phlox Rd., to Jorgenson Constr. Co., Denmark, $12,319—concrete paving 3.413 mi. Manitoc-Appleton Rd., to Lex Constr. Co., West Allis, $174,463—Wolf River Bridge, Shawano Co., to Wisconsin Bridge & Iron Co., 5023 35th St., Milwaukee, $39,674. Grand total $502,041. Noted May 28.

Wisconsin—State Hy. Comm. and Hy. Com. Grant Co., Lancaster, crushed stone surfacing County Trunk Hy. Q. to Miller & Sellnow, Monroe, $20,535—roads in Woodman and to Waterloo and Cassville, to P. W. Ryan Sons, Janesville, $17,054 and $6,550 respectively—Rockville-Dickeysville Rd. to Watson-Jenkins Constr. Co., Rewey, $5,412. Grand total $49,151.

Wisconsin—State and Hy. Coms. Marathon and Green Lake Counties, Wisconsin Rapids, concrete surfacing 2.735 mi. Seefield Grade Crossing Improvement, to Vogt-Lutz Co., Wausau, $71,861—0.33 mi. Green-Lake-Berlin Rd., 0.45 mi. Omro-Berlin Rd. and 3.95 mi. Berlin-Fairbourn Rd., to Kramp Constr. Co., Berlin, $80,237. Noted May 28.

Wis., Hudson—G. R. Hosford, city clk., curbing, guttering, concrete paving 22,926 sq.yd., to Fielding & Shepley, 216 University Ave., St. Paul, $40,932. Noted May 7.

Wyoming—State Hy. Comm., Cheyenne, grading 23.548 mi. Fremont Co., to A. E. Guilford, Wheatland, $77,506—grading, 3.22 mi. Laramie Co., to D. M. Guilford, Wheatland, $18,551—grading, bridging 8.219 mi. Park Co., to Wilson & Welch Constr. Co., Cowley, $40,604—15.797 mi. Weston Co., to Stevens Bros., 612 Endicott Bldg., St. Paul, Minn., $55,049—11.372 mi. Hot Springs Co., to R. A. Schweiger, Billings, Mont., $18,040—1.084 mi. Sublette Co., to Morrison-Knutsen Co., Boise, Idaho, $3,238—gravel surfacing 7.472 mi. Johnson and Sheridan Counties, and 20.33 mi. Platte Co., to T. J. Tobin Constr. Co., Casper, $11,469 and $35,494 respectively—surfacing 9.659 mi. Laramie Co., to M. R. Deakin, Fort Collins, Colo., $5,776—1.699 mi. Converse Co., to W. A. Norris, Cheyenne, $1,967—7.32 mi. Sublette Co., to Northwest Eng. Co., Rapid City, S. D., $4,252. Grand total $281,946.

Ont., New Toronto—Town, asphalt and concrete paving Birmingham and 3rd Sts., to R. C. Huffman Constr. Co. Ltd., 331 Bay St., Toronto. Est. $25,000.

EXCAVATION, DRAINAGE, IRRIGATION, LEVEES, RIVER AND HARBOR

PROPOSED WORK

Tex., San Antonio—Navigation Dist., c/o Senator W. A. Williamson, San Antonio (temporary), navigating San Antonio River, from point about 9 mi. from city limits to gulf, distance about 140 mi.

BIDS ASKED

Louisiana—July 6, by Bd. State Engineers, 207 New Orleans Court Bldg., New Orleans, improving 14,000 ft. Lake St. Peter Drainage Diversion, 5th Louisiana Levee Dist., incl. 275,000 cu.yd. excav., Tensas Parish; clearing 11,900 ft. right-of-way 300 ft. wide for land side borrow pits on Cottage-Kempe Clearing, in New Orleans.

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Excavation, Drainage, Irrigation, Levees, River and Harbor (Continued)

Mass., Barnstable — Hyannisport Civic Assn., c/o G. F. Clements, engr., 239 Main St., Hyannis, taking bids dredging.

Mass., Weymouth—Town, W. A. Connell, chn. Selectmen, taking bids concrete sea wall, curbing, north of Fore River. Noted Mar. 5.

New York—June 22, by Bd. Health, S. W. Wynne, pres., 505 Pearl St., New York, cleaning, maintaining ditches already installed or otherwise improve certain areas in Salt Marshlands and meadows in Brooklyn, Queens Richmond and Bronx Boros.

N. Y., Hampton Bays—July 2, by R. D. Hayes, comr. Canals & Waterways, State Office Bldg., Albany, bulkheads, etc., in Shinnecock Canal, Suffolk Co., Contr. M-72, $22,609; adv. E.N.-R. June 18.

CONTRACTS AWARDED

Massachusetts—Commonwealth of Massachusetts, Dpt. P. Wks., State House, Boston, 2,199 tons stone rip rap and dredging 40,000 cu.yd. from channel, Waquiot Bay, Falmouth and Mashpee, to Bay State Dredging & Contg. Co., 62 Condor St., East Boston, $25,220. Noted Feb. 26 under "Falmouth."

Mass., Chatham—Dpt. P. Wks., Commonwealth of Massachusetts, State House, Boston, furnishing, placing 5,000 tons heavy stone rip rap at foot of bank east of Chatham Light, to J. W. Nickerson, Chatham, $18,950. Noted Apr. 30.

Nebraska — Lancaster Co. Sanitary Dist. 1, 427 Bankers Life Bldg., Lincoln, deepening, widening Salt Creek in southeast quarter Sect. 6-10-7, to Martin-Day Co., 312 Little Bldg., Lincoln, $24,720. Noted May 7.

Pa., Erie—H. L. Munger, dir. Streets, City Hall, retaining wall, incl. 20 lin.ft. 15 in. and 20 lin.ft. 12 in. vitr. pipe, 480 lin.ft. 6 in. pipe perforated, 60 lin.ft. 6 in. c.i. pipe, 623 lin.ft. 2 in. c.i. handrail, 1,150 cu.yd. 1-3-5 concrete, 50 cu.yd. earth and 540 cu.yd. shale excav., 680 cu.yd. earth fill, Mill Creek at Glenwood Park, to E. E. Austin & Son, 20th St. and Reed Ave., $10,559. Est. $25,000. Noted May 21.

Ontario—N. Desjardines, secy. Dpt. P. Wks., Ottawa, dredging 280,000 cu.yd. sand and clay, Port Arthur and Fort William, to Great Lakes Dredging & Constr. Co., Ltd., Ottawa, $40,700. Noted May 21.

Bond Elections

Coming Bond Elections

Dams for Water Supply—Prescott, Ariz., June 27, A. J. Kline, City Engr. $200,000.
Water Supply, Enlarging and Extending—Salt Lake City, Utah, July 1. $2,000,000.
Waterworks Extensions—Smithfield, Utah, July 7. $50,000.
Airport at Gordon Head—Victoria, B. C., June 27, F. M. Preston, Engr. $240,000.
High School—Colby, Kan., $150,000.

Bonds Voted

Waterworks Extensions — Calexico, Calif., $20,000.
Waterworks Impvts. — West Munroe, La., $75,000.
Water and Sanitary Sewerage Systems—Watford City, N. D., T. R. Atkinson, Bismarck, Engr. $52,000.
Sewers, 45,000 lin.ft.—Mesa, Ariz., Morse Eng. Co., Engr. $75,000.
Bridge — Napa, Calif., $35,000. (County will provide $35,000 additional.)
School—Grand Forks, N. D., $200,000.

Bonds Defeated

Gibraltor Dam Enlargement — Santa Barbara, Calif., V. E. Trace, City Water Supt. $2,100,000.
Natural Gas Distributing System—Higginsville, Mo. $55,000.
Swimming Pool and Bath House — Nebraska City, Neb. $25,000.
Schools—St. Joseph, Mo. $1,250,000.

FEDERAL GOVERNMENT

PROPOSED WORK

Ariz., Tucson—SANATORIUM—U. S. Indian Bureau, R. M. Elliot, supt. Papago Indian Reservation, sketches sanatorium, near San Xavier Mission. $127,000.

California—WEIR—U. S. Eng., California Fruit Bldg., Sacramento, 500 ft. concrete weir at Mounton Landing on Sacramento River. $75,000.

Calif., San Luis Obispo—STORE HOUSES, etc.—U. S. Property & Disbursing Officers, 128 State Capitol, Sacramento, 3 storehouses, 9 corrals, 27 feed racks, 5 water troughs; 3 ammunition magazines; 2 m.g. reservoir; enlarging administration building at Natl. Guard Training Camp.

Calif., Stockton—DREDGING—U. S. Eng., Calif. Fruit Bldg., Sacramento, suction dredging 1,200,000 cu.yd. at Hog and Spud Islands, Stockton Deep Water Channel.

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D. C., Wash.—SENATE LIBRARY—D. Lynn, archt., Capitol, bids latter part July, annex to Senate Library. $6,500,000.

D. C., Wash.—SENATE OFFICE—D. Lynn, archt. Capitol, bids after July 1, final wing Senate Office Building. $2,500,000.

Ill., Rockford—POST OFFICE—Treas. Dpt. at office Sup. Archt., plans by Peterson & Johnson, Rockford, and B. H. Marshall, consult. archt., Wilmette, U. S. Post Office.

Ind., Noblesville—POST OFFICE—Treas. Dpt. at office Sup. Archt., rein.-con., stone, 9th and Maple Aves.

Mich., Detroit—HOSPITAL—Treas. Dpt. at office Sup. Archt., plans by Weston & Ellington, 1208 Stroh Bldg., Detroit, 4 story, brick, steel, rein.-con., stone hospital addition, at U. S. Marine Hospital. $600,000.

Mich., Selfridge Field—ASSEMBLY SHOP and WAREHOUSE—U. S. Eng., assembly shop and air corps warehouse.

Neb., Lincoln—HOSPITAL—Vet. Bu., Arlington Bldg., additional buildings, incl. recreation, quarters, personnel garage, 2 deep wells, at U. S. Veterans Hospital, J and 70th Sts. $110,000.

N. J., Paterson—POST OFFICE—Treas. Dpt. at office Sup. Archt., revised sketches by F. W. Wentworth and F. J. Vreeland, 140 Market St., and J. A. Wetmore, assoc. archt., Treas. Dpt., Wash., D. C., 2 story, basement, brick, steel, Ramapo Ave., Market and Straight Sts. $500,000. Noted June 4.

N. Y., Stapleton (mail Staten Island)—HOSPITAL—Treas. Dpt. at office Sup. Archt., bids probably early in August, brick, steel, Bay St., Tompkins and Vanderbilt Aves. $2,500,000. K. M. Murchison & W. H. Gompert, 101 Park Ave., archts. Taehan & Vought, 102 East 30th St., New York, assoc. archts. Noted Apr. 9.

N. Y., Binghamton — POST OFFICE and COURTHOUSE — Treas. Dpt. at office Sup. Archt., plans by Conrad & Cummings, assoc archts., Phelps Bldg., and L. Rich, consult. archt., 101 Park Ave., New York, post office and courthouse building.

N. Y., Mineola—POST EXCHANGE BUILDING, etc.—U. S. Eng., Mitchel Field, post exchange building and machine shop at Mitchel Field.

O., Portsmouth—LOCKKEEPERS' HOUSES—U. S. Eng., Cincinnati, three 2 story, brick lockkeepers' houses at Lock and Dam 31, on Ohio River, 3.5 mi. below here.

Pa., Phila.—DISCHARGE PIPE—U. S. Eng., five hundred 55 lengths discharge pipe.

Tenn., Chattanooga—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office, Georgia Ave., 9th and 10th Sts. $1,250,000. **Maturity in fall.** R. H. Hunt, 1st Natl. Bank Bldg., archt. Shreve, Lamb & Harmon, 11 East 44th St., New York, consult. archts. Noted Apr. 9.

Tex., Brownsville—OFFICERS QUARTERS—Con. Q.M. soon takes bids twenty 2 story, 32 x 38 ft. officers quarters at Fort Brown, near here. $160,000.

Tex., Tyler—POST OFFICE—Treas. Dpt. at office Sup. Archt., for U. S. Post Office.

Wash., Seattle—DREDGING—U. S. Eng. 943,000 cu.yd. in Dunwanish Waterway, Seattle Harbor. Noted Apr. 23.

BIDS ASKED

Ala., Montgomery — FUELING SYSTEM — July 7, by Con. Q. M., Maxwell Field, underground gasoline fueling system for airplanes at Maxwell Field; adv. E. N.-R. June 18.

Ala., Montgomery—ROADS—July 14, by Con. Q.M., Maxwell Field, roads, drains, sanitary sewers, watermains at Maxwell Field; adv. E.N.-R. June 18.

California—ROAD—June 30, by C. H. Sweetser, dist. engr. Pub. Rds., 461 Market St., San Francisco, grading 7.496 mi. Sect. B, Route 77, Mount Shasta-Mount Lassen Natl. Forest Hy., Shasta Co.

California—ROAD—July 2, by C. H. Sweetser, dist. engr. Pub. Rds., 461 Market St., San Francisco, grading 2.38 mi. Route 1, General's Hy., General Grant Natl. Park, Tulare and Fresno Counties.

Colo., Montrose—POST OFFICE—July 1, by Treas. Dpt. at office Sup. Archt., U. S. Post Office. Noted June 4.

Ga., Fort Benning—BARRACKS—July 9, by Con. Q.M., medical detachment barracks; adv. E.N.-R. June 18.

Ga., Rossville—POST OFFICE—July 6, by Treas. Dpt. at office Sup. Archt., constructing U. S. Post Office; adv. E.N.-R. June 18.

Ga., Thomson—POST OFFICE—July 7, by Treas. Dpt. at office Sup. Archt., U. S. Post Office; adv. E.N.-R. June 18.

Ind., Vincennes—MEMORIAL—July 9 (extended date) by George Rogers Clark Sesquicentennial Comn., at office F. C. Hirons and F. W. Mellor, archts., 40 East 49th St., New York, monumental building for George Rogers Clark Memorial; adv. E.N.-R. June 18. Noted May 14.

Ill., Great Lakes — DREDGING — Yards & Docks, Navy Dpt., dredging at Naval Training Station, to E. M. Melahn Constr. Co., Algonquin, $8,100.

Ill., Spring Valley—POST OFFICE—June 25, by Treas. Dpt. at office Sup. Archt., constructing U. S. Post Office.

Ind., Linton—POST OFFICE—June 26, by Treas. Dpt. at office Sup. Archt., U. S. Post Office; adv. E. N.-R. June 18.

Ind., Lafayette—FREIGHT ELEVATOR, etc.—June 26, by Treas. Dpt. at office Sup. Archt., installing 1 freight elevator and 1 dumbwaiter in U. S. Post Office.

Mass., Hingham—SHOP—Spec. 6515—June 24, by Yards & Docks, Navy Dpt., hangar extension and aircraft shop.

Mass., North Truro—STATION—June 24, by U. S. Coast Guard, 2 story coast guard station, $250,000. E. Santangini, 408 Atlantic Ave., Boston, engr. Noted Oct. 16.

Mass., Quincy—HANGAR—June 24, by Yards & Docks, Navy Dpt., Brick, steel, hollow tile hanger, at Squantum Aviation Field.

Mass., Winthrop—POST OFFICE—June 29, by Treas. Dpt. at office Sup. Archt., 1 story, basement, brick, stone, Metcalf Sq. $60,000. Noted Mar. 26.

Michigan—DREDGING—June 24, by Treas. Dpt. at office Sup. Archt., in Black River; adv. E.N.-R. June 18.

Mich., Bay City—POST OFFICE—June 24, by Treas. Dpt. at office Sup. Archt., U. S. Post Office.

Mich., Camp Custer — ADMINISTRATION BUILDING—July 7, by Vet. Bu., Arlington Bldg., administration building and alterng Buildings 5 and 6 at U. S. Veterans' Hospital.

Montana and Wyoming—ROAD—June 26, by Pub. Rds., Portland, Ore., clearing, grubbing, grading 865,000 cu.yd. road from Red Lodge to Cooke City, Mont., through the Beartooth Natl. Forest, Mont., and Shoshone Natl. Forest, Wyo. $1,000,000.

Mo., Lupus—DIKE—June 20, by U. S. Eng., 707 Postal Telegraph Bldg., Kansas City, 4,440 lin. ft. standard pile clump dikes in Missouri River at Plow Boy Bend, 2.6 mi. downstream from here.

Texas—DREDGING—June 24, by U. S. Eng., Galveston, removing 250,000 cu.yd. material deepening Cedar Bayou Channel.

Tex., Paris—ELEVATOR SHAFT, etc.—July 8, by Treas. Dpt. at office Sup. Archt., new elevator shaft and rearranging post office screen and doors in U. S. Post Office and Court House; adv. E.N.-R. June 18.

Wis., Madison—LABORATORY—July 21, by Dpt. Agriculture, Div. Purchase, Sales & Traffic, 6 story, forest products laboratory building; adv. E.N.-R. June 18.

CONTRACTS AWARDED

Calif., Sunnyvale—TEST PILES, etc.—Yards & Docks, Navy Dpt., test piles, borings at Naval Air Base, to Healy Tibbitts Constr. Co., 64 Pine St., San Francisco, $3,590.

D. C., Wash.—ALTERING—D. Lynn, archt. Capitol, altering C St. Facade, at senate office building, to McCloskey & Co., 1612 West Thompson St., Phila., Pa., $567,780. Noted Apr. 30.

D. C., Wash—CONSERVATORY—D. Lynn, archt. Capitol, conservatory at Botanical Gardens, to G. A. Fuller Co., Munsey Bldg., $604,000. Noted Apr. 16.

D. C., Wash.—TERRACE, etc.—D. Lynn, archt. Capitol, terrace, fountain, underground garage, to H. R. Blagg Co., 1229 East 3rd St., Dayton, O., $772,000. Noted May 7.

Ga., Brunswick—DREDGING—U. S. Eng., Savannah, 204,888 cu.yd. Brunswick Harbor, to Atlantic, Gulf & Pacific Co., 13 Park Row, New York, $89,925. Noted Apr. 30.

Ia., Sioux City—DIKES—U. S. Eng., 611 Insurance Exch. Bldg., 3,850 lin.ft. dikes and 200 ft. abatis in Missouri River., to Bilhorn, Bowers & Peters, Inc., 1811 Railway Exch. Bldg., St. Louis, Mo., $94,828. Noted May 21.

Mass., Boston—ELEVATOR, etc.—Treas. Dpt. at office Sup. Archt., elevator and dumbwaiter plant at U. S. Post Office, to A. B. See Elevator Co., Inc., 168 Stuart St., Boston, Mass., $415,695. Noted Jan. 8.

Mass., Hingham—ROAD—Yards & Docks, Navy Dpt., resurfacing, oiling 3,900 sq.yd. roads, to B. Weston, Hingham. Noted May 21.

Mass., Woods Hole—PILING—Superintendent Lighthouses, Chelsea, 459 ft. steel sheet piling bulkhead, to W. R. Farrell, 57 Long Wharf, Boston, $23,570. Noted May 21.

Mich., Selfridge Field — BUILDINGS — Con. Q. M., buildings, to Atkin & Stock, Inc., 14915 Good River St., Detroit, $218,310.

Miss., Lumberton—POST OFFICE — Treas. Dpt. at office Sup. Archt., U. S. Post Office, to A. Blair, 1st Natl. Bank Bldg., Montgomery, Ala., $48,725. Noted May 21.

Nevada—ROAD—C. H. Sweetser, dist. engr. Pub. Rds., 461 Market St., San Francisco, Calif., surfacing roadbed 5.238 mi. and 4.382 mi. Midland Trail (Ely Holt Natl. Creek to White Pine Co., to W. K. McMillan, 2088 Howard St., San Francisco, Calif., $16,939 and $14,242 respectively. Noted May 27 Daily.

New Jersey—DREDGING—U. S. Eng., Phila., Pa., dredging in Delaware River, from Bordentown to Trenton, to Atlantic, Gulf & Pacific Co., 13 Park Row, New York, $729,250. Noted May 7.

N. M., Albuquerque—HOSPITAL—Vet. Bu., Arlington Bldg., general contract U. S. Veterans' Hospital, to Murch Bros. Constr. Co., Railway Exchange Bldg., St. Louis, Mo., $772,000; plumbing and heating, to P. H. Meyer Co., 625 South Preston St., Louisville, Ky., $306,474. Noted Apr. 30.

O., Cleveland—BREAKWATER—U. S. Eng., Buffalo, N. Y., reinforcing breakwater Cleveland Harbor, to Great Lakes Dredge & Dock Co., Williamson Bldg., $136,181. Noted May 7.

Okla., Shawnee — INFIRMARY — Bureau Indian Affairs, Dpt. Agriculture, 2 story, basement, 43 x 128 ft. brick, stone, rein.-con. infirmary and sanitorium, to Cooke & Maxey, Elks Bldg., $55,490. Noted May 21.

Federal Government Work (Continued)

Pa., Phila.—DIKE—U. S. Eng., 3rd Sect. Pea Patch Dike, Delaware River, to Arundel Corp., Pier 2, Pratt St., Baltimore, Md., $154,660. Noted May 7.

Pa., Phila.—DREDGING—U. S. Eng., dredging in Schuylkill River, between mouth and Passyunk Ave., to Central Dredging Co., 307 North Michigan Blvd., Chicago, Ill., $698,984. Noted May 7.

S. C., Rock Hill—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office, Court House, to Batson-Cook Co., West Point, Ga., $175,793. Noted May 14.

Texas—DREDGING—U. S. Eng., Galveston, Louisiana-Texas Intracoastal Waterway, to Standard Dredging Co., Security Bldg., Galveston, $394,260. Noted Apr. 30.

Va., Quantico—BARRACKS—Yards & Docks, disciplinary barracks at Marine Barracks, to Green & Stowe, Welch, W. Va., $62,140.

Washington—ROAD—Pub. Rds., Portland, Ore., grading 4.006 mi. road, 16 and 18 ft., Pierce Co., to Strong & McDonald, Tacoma, $39,871; reconstructing 6.356 mi. Alsea Hy., 16 to 20 ft., Lincoln Co., to F. C. Dillard, Medford, Ore., $81,335.

Wash., Chehalis—DREDGING—U. S. Eng., Burke Bldg., Seattle, 422,000 cu.yd. Chehalis River, to Gray's Harbor Constr. Co., Hoquiam, $63,300. Noted Apr. 16.

Wash., Seattle—HOSPITAL—Treas. Dpt. at office Sup. Archt., 16 story, 135 x 256 ft., steel, rein.-con., stone, terra cotta marine hospital, to N. P. Severin Co., 222 West Adams St., Chicago, Ill., $1,269,900. Noted Apr. 16.

Wyo., Casper—REPAIRING WELLS—Yards & Docks, Navy Dpt., repairing shut-in wells at Naval Petroleum Reserve 3, to Rash, Rathvon & Hogan, Casper, $18,500.

C. Z., Coco Solo—SHOP—Yards & Docks, Navy Dpt., aircraft overhaul shop at Naval Air Station, to N. C. Nelson Co., 853 Bway., New York, $78,750

FEDERAL POWER COMMISSION

Applications for License and Permits

Licenses

1163 — California Oregon Power Co., 58 Sutter St., San Francisco, Calif., wants license small power project on South Fork Rogue River within Crater Natl. Forest, Jackson Co., Ore.

1164—W. W. Chadwick, Albuquerque, N. M., wants preliminary permit power project on Gila River within Gila Natl. Forest, Grant, Hidalgo and Cafron Counties.

1165—Green River Lake Lodge, Cora, Wyo., wants license small power development on Hobson Creek within Wyoming Natl. Forest, Sublette Co.

RAILWAYS

CONTRACTS AWARDED

Missouri—St. Louis & San Francisco Ry. Co., F. G. Jonah, ch. engr., Frisco Bldg., St. Louis, raising tracks 5 ft. in vicinity new railroad bridge over Southwest Ave. at Ivanhoe Ave., to Reed & Lowe, 2109 North 14th St., Birmingham, Ala.

Nevada—Six Companies, Inc., Boulder City, grading 16 mi. Hoover Railroad construction, to J. Phillips Co., 582 Market St., San Francisco, Calif. Noted May 28.

SUBWAYS AND TUNNELS

PROPOSED WORK

California—Bd. Comrs. Los Angeles Co. (Los Angeles) subway under Santa Fe Ry. at Orange Ave., partly in Arcadia and partly in Monrovia. To exceed $100,000.

BIDS ASKED

Pa., Phila.—June 30, by Dpt. City Transit, City Hall Annex, C. E. Myers, dir., Contr. 316, station finish; Cont. 317, wall tile finish for subway at Ridge Ave. and 8th St.

CONTRACTS AWARDED

N. Y., New York—Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., altering railroad structures to permit widening Lexington Ave., to Poirier & McLane Corp., 33 West 42nd St., $135,131. Noted Apr. 30.

GRADE CROSSINGS

PROPOSED WORK

Ill., Chicago—Bd. P. Wks., City Hall, E. J. Noonan, engr., New York Chicago & St. Louis R.R. Co., Cleveland, O., A. C. Harvey, ch. engr., and Chicago & Western Indiana R.R. Co., Polk and Dearborn Sts., Chicago, F. E. Morrow, ch. engr., (1st unit) opening 103 St. around Lake Calumet, incl. viaduct over railroads at 103rd St. $932,165. **Maturity indefinite.**

BIDS ASKED

Okla., Oklahoma City—Chicago, Rock Island & Pacific R.R. Co., La Salle St. Sta., Chicago, Ill., W. H. Peterson, ch. engr., taking bids 800 ft. rein.-con. underpass under railroad at South Robinson Ave. $150,000.

CONTRACTS AWARDED

California—C. H. Purcell, engr. State Hy. Comn., Sacramento, undergrade crossing under tracks Southern Pacific R.R. near Henderson Station, San Mateo Co.; to Barrett & Hilp, 918 Harrison St., San Francisco, $95,188. Noted May 14.

Wisconsin—State Hy. Comn. and Unemployment Comn., Madison, constructing Welch Overhead, Walworth Co., and Evansville Overhead, Rock Co., to H. C. Brogan, 738 East Day Ave., Whitefish Bay, Milwaukee, $55,381 and $81,564 respectively; Royalton Overhead, Waupaca Co. and West Wisconsin Rapids Overhead, Wood Co., to Garvey-Weyenberg Constr. Co., Appleton, $16,400 and $18,337 respectively; Powers Overhead, Dodge Co., to Appleton Constr. Co., Appleton, $22,469; Monroe Overhead, and Grady Overhead, Green Co., to Whitewater Bridge Co., Whitewater, $15,181 and $8,117 respectively; Green Acres Overhead, La Crosse Co., to M. Schroeder, Cashton, $24,866; Drummond Overhead, Bayfield Co., to Bystrom Bros., Ashland, $11,915. Grand total $254,230. Noted May 25.

PIERS AND WHARVES

PROPOSED WORK

Calif., San Francisco—PIER EXTENSION—Bd. State Harbor Comrs., Ferry Bldg., extending Pier 38 from present 665 ft. length to 915 ft., Piers 42, 44 and 46, from present 800 ft. length to 819 ft. length east; also connecting wharf at shore end of Piers 42 and 44, allowing cargo, office and waiting room space. $1,000,000. F. G. White Ferry Bldg., engr. Noted June 4.

Va., Norfolk—WHARVES, etc.—City council replacing wharves, warehouse, Water St., recently destroyed by fire. $250,000.

AIRPORTS

PROPOSED WORK

Mo., Bridgeton—City of St. Louis, Bd. P. Serv., City Hall, 1 and 2 story, basement, 37 to 58 x 198 ft., airport terminal building, concrete, brick, steel, glass, Lambert-St. Louis Municipal Airport. $152,000. I. R. Bowen, 301 City Hall, city engr.

Tex., Beaumont—City soon takes bids two 75 x 150 ft. steel hangars, field lighting system, water well and supply system, at airport. $90,000. Irby & Woodside, Goodhue Bldg., archts. Noted Jan. 8.

BIDS ASKED

Okla., Oklahoma City — June 30, by M. Peshek, city clk., electric light equipment for municipal airport. $27,000. L. M. Bush, City Hall, engr.

Pa., Pittsburgh—June 23, by R. G. Woodside, controller Allegheny Co., County Bldg., pump house, oil house, comfort station, electrical work, miscellaneous work, field lighting at airport field, Mifflin Twp., for Allegheny Co. $82,000. S. L. Roush, County Bldg., engr. Noted May 21.

GRAIN ELEVATORS

PROPOSED WORK

Tex., Amarillo — GRAIN ELEVATORS — Burrus Panhandle Elevators, 2701 Alamo St., Dallas, and Amarillo (3rd unit) grain elevator, 100 ft. high, 200 ft. long, corrugated iron, concrete, steel. $100,000. S. F. Hoehn, Constr. supt. of all plans.

CONTRACTS AWARDED

Mo., Kansas City — GRAIN ELEVATOR — Kansas City Southern R.R. Co., A. N. Reece, ch. engr., 11th and Wyandotte Sts., Kansas City, 85 x 182 ft. grain elevator addition, 185 ft. high, rein.-con., to M. A. Long Co., 10 West Chase St., Baltimore, Md. Est. $200,000. Norris Grain Co., F. C. Hoose, vice-pres., Bd. Trade Bldg., lessee. Noted May 21.

Mo., Kansas City — GRAIN ELEVATOR — Missouri Pacific R.R. Co., E. A. Hadley, ch. engr., Missouri Pacific Bldg., St. Louis, 169 x 195 ft., grain elevator addition, 100 ft. high, to Edwin Ahlskog Co., 1004 Baltimore Ave., Kansas City, at cost plus fee basis. Hall-Baker Grain Co., Bd. Trade Bldg., lessee.

POWER AND LIGHTING

PROPOSED WORK

Mo., Palmyra—Central States Gas & Utilities Co., Kansas City, natural gas distribution system, spur line for Hannibal-Quincy line at Mark. $50,000. Voted franchise for same.

Okla., El Reno—City, J. H. Bender, mgr., franchise election July 2, electric distribution system to Oklahoma Gas & Electric Co., 321 North Harvey St., Oklahoma City. $100,000. Byllesby Eng. & Management Corp., Chicago, Ill., engrs.

BIDS ASKED

Okla., Oklahoma City—See "Airports."

Okla., Red Oak—See "Contracts Awarded."

CONTRACTS AWARDED

N. Y., New York—E. P. Mulrooney, police comr. Police Dpt., 240 Centre St., electrical operating equipment along 5th Ave., to General Electric Co., 120 Bway. $14,115; to Interflash Signal Co., 120 Bway. $3,733, to L. A. Ward, 60 East 42nd St. $4,680; installing traffic signal posts in Central Park, to Behlert Electric Co., 132 Lexington Ave., $3,815. Grand total $26,343. Noted May 21.

Okla., Red Oak—Spiro Gas Co., Pateau, natural gas distribution system, own forces. $30,000. Private plans. Noted May 7.

PARKS AND SPORTS

PROPOSED WORK

Calif., Sacramento—Sacramento Golf Comn., c/o J. Dean, city mgr., 18-hole golf course in Del Paso Park. $100,000.

Calif., San Francisco—T. W. Crofton, Agua Caliente Jockey Club, Agua Caliente, Mexico, plans by W. McAlister, Commonwealth Bldg., San Diego, race track, club buildings, stables. $1,500,000.

Ill., Chicago — Forest Preserve Division of Cook Co., Chicago Ave. and Thatcher Rd., River Forest, soon takes bids (1st unit) development and improvement work, incl. swimming plant at Milwaukee and Devons Ave., $250,000; 18 hole golf course at Cumberland Ave. and Forest Preserve Dr., $50,000; completing Clay Hole Swimming Pool Project and beach at 159th St. and Torrance Ave., $60,000; water main system at Northwestern Golf Course. Total Est. $1,000,000.

N. J., Belmar—Bd. Boro Comrs., Boro Hall, concrete stadium on Memorial Field. $25,000. **Maturity probably soon.**

N. J., Maplewood — Maplewood Club, 11 Claremont Ave., preliminary plans concrete, tile swimming pool, on grounds. $25,000. D. W. Wright, 79 Woodland Rd., engr. Noted June 11.

N. Y., Brooklyn—Bd. Educ., 500 Park Ave., New York, soon takes bids field house, bleachers, storehouse, Gunder and Ocean Park Aves. To exceed $40,000. W. C. Martin, Flatbush Ave. extension and Concord St., archt. Noted June 4.

N. Y., Brooklyn — Young Israel Synagogue, L. L. Cohen, pres., 50th St. and 14th Ave., 2 story, 42 x 80 ft. swimming pool and baths, 50th St. and 14th Ave. $40,000. Slee & Bryson, 16 Court St., archts.

Tex., Alamo—Alamo Country Club, plans by L. Macomber, Inc., 111 West Ashington St., Chicago, Ill., golf course, landscaping, 36-hole course, gardens, dredging 2 lakes, 2 story, hollow tile, stucco, Spanish type country club plant.

BIDS ASKED

Mass., Boston — June 26, by Park Dpt., 33 Beacon St., concrete bleachers at Healy Playground, Forest Hills.

N. Y., New York—June 23, by Park Bd., W. R. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park, erecting backstops in various baseball fields in Bronx Boro; general contract, heating, ventilating, plumbing, drainage for golf house and comfort station, Mosholu Links, Van Courtland Park; electric lighting fixtures in recreational building, McComb's Dam Park extension.

N. Y., White Plains—Saxonwood Club Corp., Mamaroneck Ave., taking bids general contract swimming pool. $40,000. Noted Apr. 30.

CONTRACTS AWARDED

N. Y., New York—Dpt. Parks, W. R. Herrick, comr. Park Dpt., Arsenal Bldg., Central Park, grand stand, athletic field, McCombs Dam Park, to Glick & Simpson, 400 East Fordham Rd., $21,638. Noted May 21.

O., Cleveland — National Air Aaces, C. Gildersleeve, 227 Superior Ave. N. W., 1 and 4 story, 800 ft. long, timber, stucco stadium and administration building, Cleveland Airport to Austin Co., 16112 Euclid Ave. Est. $150,000. Noted June 4.

Okla., Tulsa—Bd. Park Comrs., N. R. Graham, pres., Municipal Bldg., general contract part 1 and 2 story, 72 x 80 ft., with two 40 x 53 ft. wings, rein.-con., brick, mixed stucco administration building, plain found., to G. Bowie, A & B Bldg., $56,112. Est. $75,000. Noted May 7.

Ont., St. Catherines—Constructing Canadian Henley Bandstand, to Aitkens, Innes & MacLachlan, St. Catherines, $40,000.

HEATING AND VENTILATING

PROPOSED WORK

Mass., Belmont—McLean Hospital, Pleasant St., and Wadsworth, Hubbard & Smith, archts., 11 Beacon St., Boston, soon let contract heating, plumbing, electrical work in nurses home, Waverly Sect. $25,000. Noted June 11, under "Hospitals, Bids Asked."

CONTRACTS AWARDED

Me., Orono—University of Maine, Treasurers Office, and R. D. Kimball Co., engrs., 6 Beacon St., Boston, Mass., boilers, stokers, boiler settings, piping and covering, coal handling equipment at Central Heating Plant, to Otto Nelson Co., 194 Exchange St., Bangor. Est. $25,000 or more.

Mass., Arlington—Town, Bd. Selectmen, heating and ventilating in high school addition, Mass. Ave., to R. B. Crocker Co., 107 Mass. Ave., Boston. $29,950.

UNCLASSIFIED

PROPOSED WORK

Mass., Walpole—MEMORIAL—Town, H. W. Caldwell, chn. com., soon takes new bids on revised plans, 1 story, brick, stone, memorial, $50,000. Former bids rejected. Putnam & Cox, 114 State St., Boston, archts. Noted May 14.

N. Y., Syracuse — PLUMBING, etc. — Bd. Supervs. Onondaga Co., Court House, plans by

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Unclassified (Continued)

J. Vedder, Syracuse, new plumbing, wiring and water system in Onondaga County Penitentiary. $90,000.

Pa., Avella — COAL WASHING PLANT and TIPPLE — Pittsburgh Terminal Coal Co., S. Pursglove, pres., 833-50 Wabash Bldg., 1 story, 50 x 150 ft., structural steel frame, asbestos siding, steel frame tipple, steel trackage. $100,000. J. L. Kostyal, 245 Cedar Blvd., Mt. Lebanon, consult. engr. H. M. Chance & Co., 5th and Chestnut Sts., Phila., engrs.

Texas—OIL PIPE LINE—Sun Pipe Line Co., Phila., Pa., and Yount-Lee Pipe Line Co., San Jacinto Life Bldg., Beaumont, purchasing right-of-way and making surveys pipe line to carry oil from 3 East Texas fields to Tidewater near Beaumont, incl. 10 in. double nipple (bell) arc pipe, with 4, 6 and 8 in. laterals, 200 mi. long, in Gregg and Rusk Counties. $2,500,000. Private plans. Noted Apr. 2 and June 4.

BIDS ASKED

N. Y., Brooklyn—STATION FINISH WORK —June 26, by Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., New York, station finish work for 7th Ave., 15th St.-Prospect Park, Fort Hamilton Parkway, and Church Ave. Stations of Rapid Transit R.R.

N. Y., New York—SPECIAL WORK, etc.— June 23, by Bd. Transportation, J. H. Delaney, chn., 250 Hudson City, supply special work (rails, frogs and switches) for Rapid Transit Railroads.

CONTRACTS AWARDED

California—GAS PIPE LINE—Southern Fuel Co., Garland Bldg., Los Angeles, hauling, stringing 163.5 mi. 26 in. O. D. steel pipe line from point on Southern Pacific right-of-way 0.5 mi. west of Sylmar to south terminus of 22 in. pipe line now in place, to Belyea Truck Co., 3128 East 26th St., Vernon, at $2.75, $2.80 and $3.80 per ton.

Mass., Adams—WAR MEMORIAL TOWER—Commonwealth of Massachusetts, War Memorial Comn., 11 Beacon St., Boston, granite, concrete, war memorial tower on Mt. Greylock, to J. G. Roy & Sons Co., 21 Silver St., Springfield, $146,009. Est. $100,000. Noted May 21.

Texas—OIL PIPE LINE—Sun Oil Co., 1608 Walnut St., Phila., Pa., furnishing 17,000 tons 10 in. steel pipe for 200 mi. oil pipe line from East Texas to Beaumont, to Jones & Laughlin Steel Co., Jones & Laughlin Bldg., Pittsburgh, Pa. Noted June 4.

Texas — PIPE LINE — Sinclair Oil Co., Palestine, 88 mi. 12 in. pipe line from Teague to Joiner, to Fredell Constr. Co., Palestine, $110,000. Noted Mar. 19.

MATERIALS

PROPOSED WORK

STRUCTURAL STEEL—**St. Louis, Mo.**—Missouri Pacific R.R. Co., E. A. Hadley, ch. engr., Missouri Pacific Bldg., soon takes bids 900 tons structural steel for 2 bridges in Arkansas.

BIDS ASKED

SEWER PIPE—**Berkeley, Calif.**—F. E. Turner, city clk., taking bids furnishing sewer pipe in car load lots for fiscal year commencing July 1.

WIRE—**Beverly Hills, Calif.**—June 30, by City Council, 44 mi. lead covered wire for use in lighting Dist. 1.

POLES—**Burbank, Calif.**—June 23, by W. S. Patterson, city mgr., twenty 35 ft., sixty-six 40 ft., nine 45 ft., eighteen 50 ft. and two 60 ft. full length, pressure-treated creosoted poles, one hundred 11 ft. 10-pin and five hundred 9 ft. 2 in. 8-pin creosoted cross arms.

STEEL BARS, etc.—**Los Angeles, Calif.**—Bd. Supervs. Los Angeles Co., taking bids 51,500 lb. galvanized iron reinforcing bars, 2,500 lb. galvanized steel reinforcing bars for use in manufacturing precast concrete blocks for Big Tujunga Wash.

WATER PIPE—**Orange, Calif.**—June 23, by P. Clark, city clk., 4,000 ft. 6 in. and 500 ft. 8 in. water pipe.

ROAD OIL, etc.—**Long Island City, N. Y.**—June 25, by G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., 200,000 gal. road oil; 3,000 cu.yd. earth embankment; 200,000 gal. gasoline; 40,000 cu.yd. cementatious road gravel; 75 tons asphaltic cement in tight containers; 100 tons asphaltic cement in tank wagons.

STEEL—**New York, N. Y.**—June 24, by P. J. Dooling, comr. Dpt. Purchase, Municipal Bldg., fabricated structural steel to Dpt. Plant & Structures; steam boilers, pump and well drilling machine to Dpt. Water Supply, Gas & Electricity; traffic control equipment to Police Dpt.

UNDERGROUND CABLE — **Cleveland, O.** — June 19, by City underground cable and pig lead for Div. Light & Heat.

COPPER TUBING, etc.—**Phila., Pa.**—June 25, by Dpt. P. Wks., Bureau Water, A. Murdock, dir., City Hall Annex, Contr. 1030, furnishing, delivering copper tubing and fittings for pilot tubes at Lardners Point Pumping Station.

BITUMINOUS MATERIAL—**Wisconsin**—June 23, by State Hy. Comn. and Hy. Comn., Shawano Co., Nicolet Bldg., Green Bay, 100,000 gal. heavy bituminous material asphalt Type C, for Keshena-Langlade Rd.

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CONTRACTS AWARDED

CULVERT PIPE—**Maquoketa, Ia.**—Jackson Co., 1,567 ft. 15- to 42-in. culvert pipe, to Iowa Culvert Pipe Co., Mason City. $1,528. Noted Apr. 2.

GIRDER RAIL, etc.—**Detroit, Mich.**—Dpt. Street Railways, furnishing 250 gross tons 7 in. girder rail, f.o.b. delivered, to Lorain Steel Co., Johnstown, Pa., at $70.65 per ton, total $17,663; 500 steel car wheels, f.o.b. delivered, to National Malleable & Steel Casting Co., Quincy Ave., Cleveland, O., at $18.75, total $9,225.

ASPHALT EMULSION—**Minneapolis, Minn.**—F. S. Gram, city purch. agt., 100,000 gal. asphalt emulsion for Paving Dpt., to Emulsified Asphalt Distributor Co., 1411 Central Industrial Dr., St. Louis, Mo., at $0.079 per gal.; 2,800 sq.yd. 1½ in. thick asphalt planking to Bridge Dpt., to W. S. Nott Co., 201 North 3rd St., $3,600. Noted May 7.

STEEL—**St. Louis, Mo.**—Missouri Pacific R.R. Co., E. A. Hadley, ch. engr., Missouri Pacific Bldg., 300 tons structural steel for bridge at Fulton, Ark., to Amer. Bridge Co., 506 Olive St., St. Louis.

LIGNIN BINDER—**Trenton, N. J.**—State Hy. Comn., Trenton, 600,000 gal. lignin binder, to Maurice R. Young, 34 Fisher Pl., $64,200.

BINDER—**Woodbury, N. J.**—Bd. Freeholders Gloucester Co., 259,500 gal. binder, to M. R. Young, 34 Fisher Pl., Trenton, at $0.1125 per gal.

STEAM ASHES—**Long Island City, N. Y.**—G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., 50,000 cu.yd. steam ashes, to Empire Cinders Delivering Co., 341 Madison Ave., New York, $43,500. Noted May 14.

ASPHALT, CEMENT, etc.—**Johnstown, Pa.**—City, c/o G. W. Griffiths, supt. Streets and P. Impvts., City Hall, 2,500 tons stone, to J. W. Walters, Johnstown, at $2.15 per ton; 3,000 tons sand, to Sheesley Supply Co., Johnstown, $2,400; 500 tons filler, to Conemaugh Quarries, Johnstown, $4.15; 19,500 gal. fuel oil, f.o.b. refinery each week, to Atlantic Refining Co., Chamber of Commerce Bldg., Pittsburgh, at $0.04.

EQUIPMENT

PROPOSED WORK

TRACTOR—**Fullerton, Calif.**—City purchasing 30 to 35 hp. tractor. F. C. Hezmalhalch, city clk.

BIDS ASKED

MOTOR TRUCK and TRACTOR — **Fresno, Calif.**—City Council taking bids motor truck and tractor for Street Dpt. H. S. Foster city clk.

ROAD GRADER—**Madera, Calif.**—July 7, by L. W. Cooper, clk. Madera Co., new 12 ft. road grader.

GRADER and SCARIFIER—**Bloomfield, Ind.** —July 7, Bd. Comrs. Greene Co., H. Rollison, aud., combination road grader and scarifier.

SNOW PLOWS—**Iowa**—June 23, by State Hy. Comn., Ames, 2 heavy duty rotary snow plows, one delivered at Mt. Pleasant, other at Leon.

TANKS—**Boston, Mass.**—June 23, by Dpt. P. Wks., J. A. Rourke, comr., compressed air tanks, piping, for Northern Ave. Bridge. $10,000.

FOREIGN

New Zealand, Wellington—June 24, by Secretary Stores Dpt., General Post Office, 8,000 ebonite or bakelite mouthpieces, 200 cap lamps, 500 nuts, locking, top, for clamping gong on bell, 300 spools resistance, 11 ohms, 60 spools resistance, 240 ohms.

New Zealand, Wellington—July 22, by Director Post & Telegraph Dpt., 4 tons jointers metals.

New Zealand, Wellington—July 28, by Secretary Stores Dpt., General Post Office, 24 condensers, 1 microfarad.

New Zealand, Wellington—Aug. 12, by Secretary Stores Dpt., General Post Office, 200 strips connection and 100 condensers, 1 microfarad.

New Zealand, Wellington—Aug. 19, by Secretary Stores Dpt., General Post Office, 1 private automatic branch exchange.

New Zealand, Wellington—Aug. 27, by Manager New Zealand Govt. Railways, supply steel or steel alloy poles to support cantilever arms and feeder wires and act as pull off supports for catenary overhead electrification system; also for complete telephone cable equipment between Wellington and Palkakariki incl. accessories, 40 pair cables for 2 mi. and 20 pair cables for 22 mi.

Commercial Buildings

RESIDENTIAL

BIDS ASKED

Ark., Hot Springs—Rector Trust Estate, c/o J. J. Rector, soon lets contract 8 story, basement 7 story tower, 60 x 108 ft., rein.-con., brick, Algonite stone hotel, also 150 car capacity garage. $850,000. G. R. Barthing, Inc., 564-65 Paul Brown Bldg., St. Louis, Mo., archts.

Calif., Oakland — T. Keenan, archt., 1440 Bway., taking bids 9 story, basement, Class A rein.-con., East 12th St., for L. J. Newton, 1130 1st Ave. $250,000.

Mass., Lynn—June 24, by Hotel Lenox, Inc., V. M. Kavanaugh, pres., 71 Spencer St., 3 story, basement, 90 x 140 ft., brick, steel hotel, office and store, plain found., Exchange and Broad Sts. To exceed $150,000. G. A. Cornet, 14 Central Ave., archt. Noted June 4.

Mass., Allston (sta. Boston)—See "Contracts Awarded."

N. Y., Brooklyn—See "Contracts Awarded."

N. Y., Hollis—See "Contracts Awarded."

N. Y., Jackson Heights — See "Contracts Awarded."

N. Y., Jamaica—See "Contracts Awarded."

N. Y., Laurelton—See "Contracts Awarded."

N. Y., Long Branch — See "Contracts Awarded."

N. Y., Rome—Gansevoort Impvt., Inc., new bids in spring, hotel, stores. $400,000. Hart & Shape, 247 Park Ave., New York, archts. Noted Jan. 15.

N. Y., New York—See "Contracts Awarded."

N. Y., St. George—See "Contracts Awarded."

N. Y., Tompkinsville (sta. Staten Island) — See "Contracts Awarded."

N. Y., Woodside—See "Contracts Awarded."

CONTRACTS AWARDED

Mass., Allston (sta. Boston)—Gardner Realty Trust, S. Aronson, 49 Hazelton St., Dorchester, 4 story, basement, brick, stone, steel, plain found., Gardner and Chester Sts., separate contracts. $160,000. Winebaum & Wexler, 74 Cornhill, Boston, archts.

N. Y., Brooklyn—Arsecy Building Corp., c/o M. Cafazzo, 972 43rd St., apartment, 68th St. and 18th Ave., separate contracts. $150,000. A. Giambalvo, 16 Court St., archt.

N. Y., Brooklyn—Baruch Lewittes, 4115 Manhattan Ave., 6 story, 101 x 141 ft., Ocean Parkway and Ditmars Ave., separate contracts. M. Peristein, c/o Owner, Archt.

N. Y., Brooklyn—H. Berg Building Corp., D. Butensky, secy., 1315 West 7th St., 6 story, 59 x 94 ft., Ocean Ave. and Lincoln Rd., separate contracts. $150,000. M. Hirsch, 350 Stone St., archt.

N. Y., Brooklyn — Corporation, c/o M. J. Goldberg, 1148 Boynton Ave., New York, 6 story, 90 x 90 ft., 22nd Ave. and 80th St., separate contracts. $250,000. S. L. Malkind, 93 Court St., archt.

N. Y., Brooklyn—Elpay Realty Corp., c/o M. Kalt, 26 Court St., 6 story, Fort Hamilton Ave. and 90th St., separate contracts. $215,000. M. N. Weinstein, 93 Court St., archt.

N. Y., Brooklyn—G and G Building Corp., c/o H. Lefreck, 4210 Church Ave., 6 story, basement, Empire Blvd. and Schenectady Ave., separate contracts. $180,000. M. Hirsch, 350 Stone St., archt.

N. Y., Brooklyn—Jade Building Corp., 458 East 54th St., 6 story, 84 x 125 ft., East 19th St. and Avenue P, separate contracts. $170,000. M. Hirsch, 350 Stone St., archt.

N. Y., Brooklyn—Kishner & Kishner, 274 Amhurst St., 6 story, 91 x 129 ft., Mayo St., separate contracts. $185,000. Seelig & Finkelstein, 153 Pierrepont St., archts.

N. Y., Brooklyn — Seven Thousand Seven Hundred Nineteen 4th Ave. Corp., 7724 5th Ave., 6 story, 77 x 121 ft., 67th St. and 18th Ave., separate contracts. $185,000. J. J. Millman, 67 Court St., archt.

N. Y., Hollis — F. C. Trump Constr. Co., 175-19 Devonshire Rd., apartment, 206th St. and 89th Ave., separate contracts. $240,000. Private plans.

N. Y., Jackson Heights—Hamilton Constr. Co., 93rd St. and Northern Blvd., 6 story, 87 x 207 ft., 60th St. and Roosevelt Ave., separate contracts. $400,000. W. Hohauser, 17 West 44th St., New York, archt.

N. Y., Jamaica—Gatehouse Bros., 8924 164th St., 5 story, basement, 164th St. and 89th Ave., separate contracts. $150,000. C. Infanger & Sons, 2634 Atlantic Ave., Brooklyn, archts.

N. Y., Kew Gardens—P. Kaye, 132 Irwin St., Brooklyn, apartment, Metropolitan Ave. and Leffert St., separate contracts. $150,000. Private plans.

N. Y., Laurelton—Laurelton Homes, 160-16 Jamaica Ave., Jamaica, apartment, 229th St. and 130th Ave., by separate contracts. $380,000. A. Allen, 163-18 Jamaica Ave., Jamaica, archt.

N. Y., Long Beach—J. Manowitz, 96 5th Ave., New York, 6 story, 100 x 150 ft., brick, timber apartment hotel, separate contracts. $400,000. H. Hurwitt, 41 West 33rd St., New York, archt. Noted Jan. 22.

N. Y., New York—Three Hundred Ten East 55th Street, Inc., c/o S. Lipman, 11 West 42nd St., 12 story, 75 x 90 ft., 316 East 55th St., separate contracts. $500,000. G. G. Miller, 545 5th Ave., archt.

N. Y., St. George — J. Cohen, 201 East Mosholu Parkway, New York, 6 story, basement, 100 x 200 ft., brick, steel, foot Hill Circle and Daniel Low Terrace, separate contracts. $500,000. L. Pisciotta, 1913 Arthur Ave., New York, archt.

N. Y., Tompkinsville (sta. Staten Island)— Fifty Ward Avenue Corp., 921 Bergen Ave., Jersey City, N. J., 5 story, basement, 100 x 125 ft., brick, steel, Bayview Pl. and Ward Ave., separate contracts. $200,000. C. I. Goldberg, 921 Bergen Ave., Jersey City, N. J., archt.

Residential (Continued)

N. Y., Woodside—F. R. Wenzel Realty Corp., 3929 55th St., 6 story, Queens Blvd. and Woodside Ave., separate contracts. $150,000. C. L. Koester, 163-18 Jamaica Ave., Jamaica, archt.

CLUBS

PROPOSED WORK

Calif., San Francisco — See "Sports and Parks."

Md., Baltimore—Baltimore Country Club, Club Rd., 2 and 3 story, basement, brick, Club Rd. $250,000.

N. J., Allendale—Women's Club, B. W. Griffiths, in charge, Brookside Ave., 2 story, basement, brick, steel club house. $150,000. **Maturity probably in September.** Noted May 7.

N. J., Bayonne—B. P. O. E., Bayonne Lodge, 39 West 34th St., 2 story, basement, brick, steel addition. $150,000. **Maturity in September.** C. I. Goldberg, 921 Bergen Ave., Jersey City, archt. Noted June 4.

N. J., Long Branch—Young Men's Progressive Assn., c/o Commercial Hotel, 149 Bway., will not build two 2 story, basement, brick, steel solariums, Ocean Front and Bath Ave. $200,000. Project abandoned. Noted Apr. 2.

N. J., Orange—Women's Club of Orange, 556 William St., East Orange, 2 story, basement, brick, steel, 349 South Center St. $150,000. **Maturity in fall.** D. E. Waid, 1 Madison Ave., New York, archt. Noted June 4.

N. Y., New York—Women's National Republican Club, 6 East 37th St., plans by F. R. King, 18 East 48th St., club. To exceed $150,000. Noted May 7.

N. Y., Searsdale—Saxonshire Country Club, new club house, swimming pool. $150,000. **Maturity in fall 1932 or later.** W. S. Phillips, 521 5th Ave., New York, archt. Noted Oct. 2.

N. Y., White Plains—Women's Contemporary Club, c/o J. C. Backes, 9 Greenridge Ave., club. **Maturity in November or later.** C. B. Wendehack, 101 Park Ave., New York, archt. Noted May 1, 1930.

BIDS ASKED

N. J., Clifton—Lee & Hewitt, archts., 152 Market St., Paterson, bids about July 15 (from selected list of contractors), general contract 2 story, basement, brick, steel addition, Clifton Ave., for Clifon Lodge B. P. O. E., 725 Clifton Ave. $150,000. Noted June 4.

O., Canton — Building Com., Odd Fellows Lodge, bids about July 19, 2 story, basement, brick, stone lodge home, Cleveland Ave., N. $150,000. J. E. Lewis Co., New Shaffer Bldg., archts. Noted May 28.

Pa., Johnstown—Masonic Temple Assn. taking bids 3 story, concrete, brick, steel club. $300,000. J. E. Fulton & Son, Uniontown, archt.

HOSPITALS

PROPOSED WORK

Colo., Pueblo—State Bd. Correction, c/o T. A. Duke, 511 West 13th St., plans by W. DeMordaunt, 738 1st Natl. Bank Bldg., 2 story, basement, concrete, steel, brick nurses' home, dormitory. $185,000. Noted May 28.

N. H. Concord—New Hampshire Hospital, W. A. Stone, State House, dormitory at hospital. $175,000. Architect not selected.

N. J., Holmdel—Dpt. Institutions & Agencies, State Office, Trenton, institutional buildings, incl. administration building, employees' home, at New Jersey State Hospital grounds. $1,350,000, Div. Architecture & Constr., State Office, Trenton, archt.

N. J., Jersey City—Jewish Hospital Assn., B. S. Pollick, chn., Laurel Hill, Secaucus, will not build 4 story, basement hospital, Fowler and Van Nostrand Aves. $1,000,000. Project abandoned. Architect not selected. Noted Mar. 12.

N. J., Newark—Bd. City Comrs., City Hall, 2 story, 30 x 110 ft., brick, steel ward and recreation building, Ivy Hill Almshouse. $200,000. Project in abeyance. J. T. Simpson, 45 Walnut St., archt. Noted May 7.

N. J., Preakness—Bd. Freeholders Passaic Co., Court House, Paterson, 2 story, basement, brick, steel children's unit and preventorium, Valley View. $500,000. F. W. Wentworth, 140 Market St., Paterson, archt. Noted June 11.

N. J., Skillman—Dpt. Institutions & Agencies, State Office Bldg., Trenton, plans by Div. Architecture & Constr., Trenton, 2 story, basement, brick, steel dormitory, at State Village for Epileptics. $150,000. **Maturity probably soon.**

N. Y., Freeport—Freeport Hospital, 3 story, Prince and Pennsylvania Aves. $500,000. **Maturity in summer 1932.** Purdy & Davis, 350 Madison Ave., archts. Noted Jan. 22.

N. Y., New York—Bronx Eye, Ear, Nose & Throat Hospital, Echo Pl. and Tremont Ave. $450,000. **Maturity in summer or fall 1932.** DePace & Juster, 151 West 46th St., archts. Noted May 1, 1930.

N. Y., New York—Dpt. Hospitals, Municipal Bldg., children's tuberculosis camp, foot 26th St. $350,000. **Maturity late in fall or winter.** M. Bernstein, 2 Columbus Circle, archt. Noted Apr. 2.

N. Y., New York—Gotham Hospital, 17 East 42nd St., 9 story hospital, nurses' home. $3,000,000. G. Atterbury, 139 East 53rd St., archt. Project in abeyance. Noted Jan. 8.

N. Y., New York — Italian Benevolent Institute, 22 East 42nd St., bids about October, general contract 9 story nurses' home and training school. $1,000,000. DePace & Juster, 151 West 46th St., archts. Noted Jan. 8.

N. Y., New York—New York Infirmary for Women & Children, 312 East 15th St., hospital group, Stuyvesant Sq. $3,000,000. **Maturity in 1932 or later.** Bottomley, Wagner & White, 60 East 42nd St., archts. Noted Jan. 22.

N. Y., Syracuse—Bd. Supervs. Onondaga Co., combination nurses' building and superintendent's home, Onondaga Sanatorium, West Seneca Turnpike. $150,000.

Okla., Supply—Western Oklahoma Hospital, c/o State Bd. Affairs, State House, Oklahoma City, sketches brick, stone hospital, $125,000; brick, concrete power plant, $85,000.

Wis., Milwaukee—Eschweiler & Eschweiler, archts., 210 Mason Bldg., soon lets contract 4 story, 48 x 100 ft., brick, rein.-con. hospital addition, North Maryland Ave., for Columbia Hospital. Noted May 21.

T. H., Honolulu—C. W. Dickey, archt., S. M. Damon Bldg., soon takes bids 3 story nurses' home, for Queens Hospital. $250,000. Noted Apr. 23.

BIDS ASKED

Miss., Jackson—June 26, by State Hospital Removal Comn., 10 new buildings for Insane Hospital. N. W. Overstreet, Jackson, archt.

N. J., Preakness—Bd. Freeholders Passaic Co., Court House, Paterson, bids about July 1, 3 story, basement, brick, steel welfare house and detention home, Oldham Rd. $750,000. F. W. Wentworth, 140 Market St., Paterson, archt. Noted May 14.

N. Y., Middletown—July 1, by Dpt. Mental Hygiene, State Office Bldg., Albany, reconstructing old main buildings, and additional patient and employee accommodations, at Middletown State Homeopathic Hospital; adv. E.N.-R. June 18.

N. Y., Staten Island — July 1, by Dpt. Hospitals, Municipal Bldg., New York, general contract Male Pavilions A, B, C and D, at New York City Farm Colony.

CONTRACTS AWARDED

Mass., Northampton — Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, 3 story, basement, 40 x 210 ft., brick, steel nurses' home, to D. A. Sullivan & Son, 78 Main St. Est. $125,000-$150,000. Noted May 21.

Mass., Worcester—Worcester County Tuberculosis Hospital, E. W. Glidden, Court House, and 3 story, basement, rein.-con., steel sanatorium, nurses home and power house, plain founds., at Huntington Farm, Boylston and West Boylston, to Wiley & Foss, Central and Brooks St., Fitchburg, $956,655; heating and ventilating, to Jennison Co., 17 Putnam St., Fitchburg, $221,900; plumbing, to Tucker & Rice, Inc., 165 Commercial St., Worcester, est. exceeds $25,000.

N. J., Riverside—Morris & Erskine, archts., 1716 Cherry St., Phila., Pa., 3 story, basement, 45 x 149 ft., brick, rein.-con., steel hospital, to J. S. Rogers Co., Drexel Bldg., Phila., Pa., for Zarbrugg Memorial Hospital. Est. $200,000. Noted June 4.

Vt., Barre—Barre City Hospital, F. E. Langley, chn. Bd. Trustees, altering and constructing 2 story, basement, brick, concrete addition, concrete found., to A. B. Lane, 38 Highland Ave. $150,000. Noted May 21.

CHURCHES

PROPOSED WORK

Mass., Malden—Temple Tefereth Israel, c/o B. Kaplan, 184 Bryant St., temple. $150,000 or more. Architect not selected.

Mich., Detroit—Nardin Park Methodist Episcopal Church, 5151 West Chicago Ave., plans by Stahl & Adams, 628 McKerchey Bldg., 2 story, basement, brick, steel, concrete, stone, granite, plain found., Chicago Blvd., Nardin Park. $300,000.

N. J., Hawthorne—St. Anthony's Roman Catholic Church, W. E. Thompson, pastor, 286 Diamond Bridge Ave., 1 story, basement, 70 x 125 ft. church. $160,000. Bids in, project in abeyance. T. J. Folks, 488 East 33rd St., Paterson, archt. Noted June 4.

N. J., Jersey City—Sacred Heart Roman Catholic Church, M. J. Ripple, pastor, Bayview Jackson Aves., 4 story, basement, brick, steel convent, rectory, education, social center, Bayview and Bidwell Aves. $500,000. **Maturity about September.** Guilbert & Betelle, 20 Branford Pl., Newark, archts. Noted June 4.

N. J., Maplewood — Wyoming Presbyterian Church, S. P. Shackleton, chn. building com., 430 Wyoming Ave., will award contract about July 10, 2 story, basement, brick, steel church. $150,000. Bids in. H. B. Upjohn, Grand Central Terminal, New York, archt. Noted Apr. 23.

N. J., Wildwood—Trinity Lutheran Church will not build 2 story, basement, brick, steel church. $150,000. Stackhouse & Donahue, 313 South Smedley St., Phila., Pa., archts. Project abandoned. Noted Feb. 3.

N. Y., New York—Free Synagogue, 40 West 68th St., synagogue, 9 West 64th St. $1,000,000. **Maturity latter part 1932.** Noted Nov. 14, 1929.

BIDS ASKED

Conn., Bridgeport—St. Cyril's and St. Methodius Roman Catholic Church, G. Panik, pastor, 79 Church St., taking bids 3 story, 45 x 62 ft. and 45 x 65 ft., rein.-con., brick, steel convent, Church St. $150,000. J. A. Jackson, 185 Church St., New Haven, archts. Noted Mar. 5.

N. J., Dunellen—Poggi & Braglow, archts., 274 Morris Ave., Elizabeth, taking bids 2 story, basement, brick, steel parish house, for First Methodist Church. $200,000. A. M. Korff, 203 Park Ave., Plainfield, assoc. archt. Noted June 4.

N. J., Elizabeth—L. Quien, Jr., archt., 229 Broad St., taking bids general contract 1 story, basement, brick, steel, 858 Jersey Ave., for Swedish Lutheran Church, S. Jacobsen, 233 Rahway Ave. $150,000.

N. J., Glen Ridge—Guilbert & Betelle, archts., 20 Branford Pl., Newark, bids about July 15, general contract 2 story, basement, brick, steel church, Sunday school, for Glen Ridge Congregational Church, Ridgewood Ave. $250,000. Noted May 28.

N. J., Perth Amboy—G. W. Brooks, archt., 216 Smith St., bids about Aug. 15, general contract 2 story, basement, brick, steel convent, Mechanic St., for St. Mary's Roman Catholic Church. $250,000. Noted May 7.

N. J., Raritan—St. Ann's Roman Catholic Church taking bids general contract 1 story, basement, 50 x 105 ft., brick, steel, plain found. $150,000. DePace & Juster, 151 West 46th St., New York, archts. Noted June 4.

CONTRACTS AWARDED

N. J., Elizabeth—St. Genevieve's Roman Catholic Church, general contract 3 story, basement, brick, steel convent, 108-12 Princeton Rd., to Thomas Reynolds Sons, 26 Sanford Terrace, Irvington. Est. $150,000.

N. J., Nutley—Latenser, Bastow & Wax, archts., 15 East 40th St., New York, altering and constructing 2 story, basement, brick, steel, convent addition, St. Mary's Pl., to T. C. Conroy, 95 Tiffany Pl., Maplewood, for St. Mary's Roman Catholic Church, St. Mary's Pl. Est. $150,000. Noted May 21.

N. Y., Brooklyn—Church of Our Lady of Angeles, 367 Clermont Ave., 3 story school, and 4 story rectory, to H. A. Harris Co., 16 East 43rd St., New York. Est. $150,000. Contractor soon lets separate contracts. Noted June 4.

Que., Montreal—Roman Catholic Church of St. Philomen, church, Masson St., to A. Gratton, Ltd., 1117 St. Catherine St. W., $280,000.

SCHOOLS

PROPOSED WORK

Calif., San Francisco — Bd. P. Wks., S. J. Hester, secy., and Bd. Comrs. San Francisco Co., sketches Bernal Junior High School, Highland Ave. and Holly Park Circle. $620,000.

Calif., San Francisco—City and San Francisco Co., S. J. Hester, secy. Bd. P. Wks., sketches Longfellow School. $150,000. Architect not selected.

Conn., New London — City, P. L. Harwood, School Bd., 224 State St., brick addition to Harbor School. $150,000. Architect not selected.

Ind., Muncie — St. Marys Catholic Church rejected bids 2 story, basement, 42 x 105 ft., brick, steel school, Jackson and Nichols Aves. $150,000. H. F. Smiemner, 108 East Washington St., archt.

Kan., Colby—Bd. Educ. plans by Mann & Co., 721 Rorabaugh-Wiley Bldg., Hutchinson, 3 story, concrete, brick, stone high school. Circulating petition for $150,000 bond election.

Mass., Lincoln—Town, School Com., Town Hall, high school, Station St. $200,000. Architect not selected.

Mass., Wareham—Town, B. C. Merry, chn. building com., altering and constructing 2 story, basement, brick high school addition, Marion Rd. $150,000. Architect not selected.

Mass., Watertown—Rosary Academy, M. Victorine, sono lets contract 3 story, basement, 75 x 110 ft., brick, concrete parochial day and boarding school, Lexington St. $150,000. E. T. P. Graham, 171 Newbury St., Boston, archts. Noted June 4.

Mass., Worcester—Worcester Academy, S. F. Holmes, headmaster, Lewis J. Warner Memorial Auditorium at academy. $250,000. Private plans. H. M. Warner, 1277 East 14th St., Brooklyn, N. Y., donor.

N. J., Dunellen—Bd. Educ., Old New Market, 2 story, basement, brick, steel, rein.-con. high school. $150,000. **Maturity probably soon.** Architect not selected.

N. J., Fort Lee—Bd. Educ., High School Junior High School, 2 story, brick, steel, $150,000. **Maturity probably soon.** Architect not selected.

N. J., Freehold—Freehold Military Academy, 2 story, basement, brick, steel school. $200,000. Project in abeyance until fall. J. Eberson, 370 Lexington Ave., New York, archt. Noted Apr. 16.

N. J., Glen Gardner — Dpt. Institutions & Agencies, State Office Bldg., Trenton, brick, steel school, at State Sanitarium for Tubercular Diseases. $150,000. **Maturity probably soon.** Div. Architecture & Constr., State Office Bldg., Trenton, archt.

N. J., Hasbrouck Heights—Bd. Educ., Administration Bldg., altering and constructing 2 story, basement, brick, steel, rein.-con. addition to Lincoln School. $150,000. **Maturity probably soon.** Architect not selected.

N. J., Hasbrouck Heights—Bd. Educ., Administration Bldg., altering and constructing 2 story, basement, brick, steel addition to Franklin School. $165,000. **Maturity probably soon.** Architect not selected.

N. J., Hawthorne—Bd. Educ., Lafayette St., will not build 6 story, basement, brick, steel, rein.-con. high school. $150,000. Project abandoned. Noted Feb. 5.

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Schools (Continued)

N. J., Highland Park—Bd. Educ., Junior School, will not build 2 story, basement addition to Franklin Junior High School, Mahar Tract. Project abandoned. Noted Jan. 1.

N. J., Hillside—Bd. Educ., Central Grammar School, Junior High School, 3 story, basement, Hillside Ave. and Chestnut St. $250,000. **Maturity probably soon.** Architect not selected.

N. J., Kearny (sta. Arlington) Bd. Educ., Devon St., sketches by Guilbert & Betelle, 20 Branford Pl., Newark, altering and constructing 2 story, basement, brick, steel addition, to Roosevelt School, Magnolia Ave. $150,000.

N. J., Linden—Bd. Educ., St. George Ave., revised plans by H. B. Brady, Inc., 333 North Broad St., Elizabeth, two 2 story, basement, brick, steel, rein.-con. wings to Senior High School, St. George Ave. $410,000. Noted Dec. 19.

N. J., Lyndhurst (br. Rutherford) — Bd. Educ., High School, will not build 2 story, basement addition to Washington School, Ridge Rd. $200,000. Project abandoned. Noted Mar. 19.

N. J., Maywood—Bd. Educ. sketches by G. F. Reeke, 221 Prospect Ave., 2 story, basement, brick, steel addition to School 1, Maywood Ave. $150,000. Noted June 4.

N. J., Middlebush—Bd. Educ. Franklin Twp., R. W. Thompson, chn. Com. Buildings & Grounds, sketches by J. N. Pierson & Son, 198 Jefferson St., Perth Amboy, 2 story, basement, brick, steel school, West side. $150,000.

N. J., Morrison—Bd. Educ., 50 Early St., plans by C. Voorhees, 1 Schuyler Pl., two 2 story, basement, 36 x 150 ft., brick, steel, rein.-con. additions, Speedwell Ave. $150,000. Noted June 11.

N. J., New Providence — Bd. Educ., School Bldg., 2 story, brick, steel, rein.-con. high school. $150,000. **Maturity probably soon.** Architect not selected.

N. J., Passaic—Passaic City Club, Prospect St., will not build 2 story, basement, brick, steel club house, Gregory Ave., $150,000. Project abandoned. Preiskel & Skvarla, 629 Main Ave., archts. Noted May 21.

N. J., Plainfield—Bd. Educ., 119 West 9th St., 2 story, basement, brick, steel, rein-con. addition to McKinley School. $150,000. **Maturity in September.** Architect not selected. Noted May 28.

N. J., Rahway—Bd. Educ., High School, Junior High School, 3 story, basement, brick, steel, rein.-con., Central Ave. near St. George Ave. $480,000. **Maturity about September.** Seymour Williams, 146 Irving St., archt. Noted June 4.

N. J., Springfield—Bd. Educ., Short Hills Ave., 2 story, basement, brick, steel, rein.-con. high school. $150,000. Project in abeyance. J. T. Simpson, 45 Walnut St., Newark, archt. Noted Feb. 26.

N. J., Teaneck—Bd. Educ., High School, bids in August, 3 story, basement, 100 x 220 ft., brick, steel high school additino, Queen Anne Rd. $635,000. Hacker & Hacker, 201 Main St., Fort Lee, archts. O. E. Goldsmith, 110 West 40th St., engr. Noted May 21.

N. J., Union—Bd. Educ. will not build 2 story, basement, brick, steel high school. $150,000. Project abandoned. Noted Feb. 19.

N. J., Union—Bd. Educ., 2 story, basement, brick, steel, addition to Connecticut Farms School, Stuyvesant and Morris Aves. $200,000. Project in abeyance. F. A. Elsasser, 1000 Stuyvesant Ave., archt. Noted May 21.

N. Y., Brooklyn—Bd. Educ., 500 Park Ave., New York, sketches by W. C. Martin, Flatbush Ave. extension and Concord St., P. S. 112, 15th Ave. and 71st St. $415,000.

N. Y., Brooklyn—Bd. Educ., 500 Park Ave., New York, sketches by W. C. Martin, Flatbush Ave. extension and Concord St., P. S. 248, Avenue U, East 12th and East 13th Sts. $380,000.

N. Y., Brooklyn—Roman Catholic Church of Good Shepard, 1952 Batchelder St., 3 story, 62 x 100 ft. school, Brown St. and Avenue S. $150,000. **Maturity soon.** General contract or let without competition. H. J. Gill, 415 Lexington Ave., New York, archt. Noted June 4.

N. Y., Cold Spring—Bd. Educ., Cold Spring, bids in fall or later, general contract school. $250,000. Knapp & Morris, 171 Madison Ave., New York, archts. Noted Jan. 22.

N. Y., Flushing—Bd. Educ., 500 Park Ave., New York, plans by W. C. Martin, Flatbush Ave. extension and Concord St., Brooklyn, addition to P. S. 20, Sanford Ave. and Union St. $150,000.

N. Y., New York — Catholic Institute for Blind, J. G. Neeser, will award contract about July 15, 3 story orphanage, Paulding Ave. and 220th St. $150,000. R. J. Reiley, 12 East 41st St., archt. Noted May 14.

N. Y., Whitestone—Bd. Educ., 500 Park Ave., New York, revised plans by W. C. Martin, Flatbush Ave. extension and Concord St., Brooklyn, addition to P. S. 79, 7th Ave. $360,000. Noted May 15, 1930.

Pa., Pittsburgh—Bd. Educ., H. W. Cramblet, secy., Administration Bldg., sketches Concord Elementary School, probably brick, steel, Carrick Ave. $220,000. C. L. Wooldridge, Inc., Fulton Bldg., consult. engr. Architect not selected.

Pa., Pittsburgh—Bd. Educ., H. W. Cramblet, secy., Administration Bldg., East Brookline Elementary School, brick, steel, Provost site. $200,000. C. L. Woolridge, Inc., Fulton Bldg., consult. engr. Architect not selected.

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Pa., Pittsburgh—Bd. Educ., H. W. Cramblet, secy., Administration Bldg., Liberty Elementary and Junior High School, brick, steel, Ellsworth Ave. $700,000. C. L. Woolridge, Inc., Fulton Bldg., consult. engrs. Architect not selected.

Pa., Springdale — Bd. Educ., B. D. Remley, secy., 511 Roslyn Ave., bids early in **July**, 2 story, basement, brick, steel high school, Colfax St. near Ridge St. $150,000. J. H. Phillips, Wabash Bldg., Pittsburgh, archt.

R. I., Central Falls — St. Basil's Roman Catholic Church, T. Jock, pastor, 439 Central St., parochial grade school, Hunt St. $150,000 or more. Architect not selected.

R. I., New Shoreham — Town, W. S. Mott, chn. building com., sketches by E. M. Corbett, 49 Purchase St., Fall River, Mass., 2 story, basement, brick school. $150,000. Noted Dec. 11.

Tex., San Antonio—Bd. Educ., Lavaca and Water Sts., postponed opening bids altering 3 buildings and constructing 3 story, basement, new building for vocational school, Main and Romana Sts. $183,000. H. P. Smith, Natl. Bank Commerce Bldg., archt. Phelps & DeWees, Gunter Bldg., School Bd., archts. Noted May 21.

Tex., San Antonio—Bd. Educ., Lavaca and Water Sts., plans by Phelps & DeWees, Gunter Bldg., San Antonio School Bd., Junior High School, 3 story, 100,000 sq.ft. floor space, Piedmont St. $750,000.

Vt., Middlebury—Middlebury College, J. A. Fletcher, dormitory. $225,000. Architect not selected.

Ont., Kingston—Dpt. Natl. Defence, Ottawa, plans by C. Drever, 81 Brock St., rebuilding administration building at Royal Military College, recently damaged by fire. $170,000.

BIDS ASKED

Ark., Arkadelphia—July 7, by Bd. Educ. School Dist. 1, 3 story, 136 x 206 ft., rein.-con., brick, stone high school incl. auditorium 650 seating capacity, gymnasium, library, administration officers, science laboratories. $140,000. Petter & McAninch, Pyramid Life Bldg., Little Rock, archts. Noted May 14.

Ark., Jonesboro — Arkansas Agricultural & Mechanical College 1st Dist., bids about July 1, 4 story, basement, 146 x 206 ft., rein.-con. brick, stone, incl. offices, laboratories, studios, chapel, 1,000 seating capacity auditorium. $250,000. Petter & McAninch, Pyramid Life Bldg., Little Rock, and E. W. Mann, Cotton Exch. Bldg., Memphis, Tenn., archts. Noted May 14.

Calif., San Francisco—June 17, by S. J. Hester, secy. Bd. P. Wks., City Hall, general contract 2 story, basement, brick, steel addition to Girls' High School, Scott and O'Farrell Sts., for City and San Francisco Co. Former bids rejected. Noted May 21.

Md., Baltimore—June 24, by Bd. Awards, Garrett Heights School, 2 story, basement, brick, Ailsa St. and Morello Rd. $150,000. Owens & Sisco, Continental Bldg., archts. H. F. Doeleman, Baltimore Trust Bldg., engr.

Mass., Brighton (sta. Boston)—St. Columbkilles Roman Catholic Church, J. V. Tracy, pastor, 321 Market St., taking bids altering and constructing 2 story, basement, brick school addition, plain found. $150,000 or more. Magimnis & Walsh, Statler Bldg., Boston, archts.

Mass., Everett—City, Locust St., taking bids 2 story, basement, brick, stone school, plain found. $150,000. Desmond & Lord, 1 Beacon St., Boston, archt.

Mass., Framingham—Town, R. Harvey, chn. com., taking bids altering and constructing 3 story, basement, brick, stone, high school addition, plain found., Union Ave. $150,000. G. F. Marlowe, 240 Boylston St., Boston, archt.

Mass., Falmouth—June 29, by Town, P. Dillingham, supt. schools, 2 story, basement, brick, rein.-con., steel. $175,000. H. F. Kellogg, 378 Stuart St., Boston, archt. Noted June 4.

Mass., Springfield—City, C. J. Morrow, chn. building com., taking bids Technical High School, 3 story, basement, irregular sized, brick, steel, concrete, Elliot St. $400,000. F. W. S. King, E. C. and G. C. Gardner, 33 Lyman St., archts.

N. H., Andover — Proctor Academy, C. B. Wetherell, Andover, taking bids 2 story, basement, brick academy building, plain found., on campus. $150,000-$175,000. Kilham, Hopkins & Greeley, 9 Park St., Boston, Mass., archts.

N. H., Durham — State University of New Hampshire, E. M. Lewis, Durham, taking bids 2 story, basement, brick, steel infirmary and rest house, plain found., college campus. $150,000. E. T. Huddleston, Durham, archt. Kilham, Hopkins & Greeley, 9 Park St., Boston, Mass., consult. archts. Noted Apr. 23.

N. J., Englewood—Bd. Educ. bids about Aug. 1, Junior and Senior High School, 2 story, basement, brick, steel. Knickerbocker Rd. $850,000. L. C. Licht, 4 Dean St., Englewood, archt. Noted May 7.

N. J., Long Branch—Bd. Educ., bids about July 1, 2 story, basement, brick, steel addition, Bway. $150,000. H. I. Braun, 501 Harrison, St., archt. Noted May 28.

N. J., Middlebush—Bd. Educ. Franklin Twp., R. W. Thomson, chn. Com. Buildings & Grounds, bids about July 1, general contract 2 story, basement, brick, steel, West Side. $150,000. J. N. Pierson & Son, 198 Jefferson St., Perth Amboy, archts. Noted June 18.

N. J., Oakhurst — Bd. Educ. Ocean Twp., bids about July 15, 2 story, brick, steel addition. $150,000. W. Pieper, 95 Summit Ave., Summit, archt. Noted May 21.

N. J., Union—Bd. Educ., bids about July 15, 2 story, basement, brick, steel, rein.-con., north end section Oakland Ave. $300,000. F. A. Elsasser, 1000 Stuyvesant Ave., archt. Noted June 4.

Pa., Lawrence Park—June 22, by Bd. Educ. P. Gill, secy., 2 story, 95 x 145 ft., brick, steel high school. $150,000. C. S. Kirby, 321 Commerce Bldg., Erie, archt.

CONTRACTS AWARDED

Ind., Brookville—School Comrs. general contract rein.-con., brick, stone, to Maynard E. Welch, Rockville, heating and plumbing, to H. W. Brockman, Brookville. Est. $150,000. Noted May 21.

Ind., Knightstown—Schools Comrs., general contract 2 story, basement, 75 x 100 ft., rein.-con., brick, stone high school, to M. Cutshall, Akron; heating and plumbing, to W. G. Hoffman, French Lick. Est. $150,000. Noted May 21.

Ind., Michigan City—School Comrs., general contract 2 story, basement, rein.-con., brick, stone addition, incl. auditorium, to E. A. Hulting Constr. Co., 217 Superior St. Est. $150,000. Noted May 14.

Ind., South Bend — Notre Dame University, general contract 2 story, basement, rein.-con. stone engineering college, on campus, to R. Sollitt & Sons, 518 Sample St. Est. $500,000.

Me., Cape Elizabeth—Town, C. W. Leonard, chn., 415 Congress St., altering and constructing 2 story, basement, brick school addition, plain found., to N. E. Redlon Co., 80 Union St., Portland. Est. $150,000. Noted May 21.

Md., Baltimore — Bd. Awards, West Baltimore Colored Elementary School, 3 story, basement, 96 x 135 ft., brick, steel, to J. L. Robinson Contg. Co., 522 Park Ave., $206,923. Noted May 28.

Mass., Boston—City, Dpt. School Buildings, 2 story, basement, brick, limestone, granite, plain found., Dorchester, to Matthew Cummings Co., 43 Tremont St., $234,200. Noted Jan. 18.

Mass., Cambridge—Harvard University, A. L. Lowell, pres., 1 story, basement, brick, limestone, steel memorial chapel, plain found., college grounds, to Hegeman-Harris Co., 185 Devonshire St., Boston. Est. $1,000,000.

Mass., Malden—Immaculate Conception Roman Catholic Church, R. Noaglo, pastor, 2 story, basement, brick steel high school, to Thomas O'Connor & Co., 238 Main St., Cambridge. Est. $150,000. Noted May 21.

Mass., Worcester—City, Public Building Dpt., City Hall, general contract 1 story, 80 x 180 ft., brick, steel, concrete, to A. J. Gendron, 136 Dewey St., $112,865. Noted May 7.

Mo., Kansas City—Bd. Educ., 2 story, basement, 111 x 144 ft., rein.-con., brick addition to Fairmont School, to E. L. Winn Constr. Co., Railway Exch. Bldg., Kansas City, $121,535. Noted May 25.

N. J., Haledon—Bd. Educ., A. Troyano, clk., School Bldg., general contract 2 story, basement, brick, to Main Constr. Co., 110 Park Pl., Passaic, $85,775; plumbing, to P. DeRonde, 76 Union Ave., Paterson, $5,240; heating, to D. McGrath Co., 185 Moore St., Hackensack, $10,900; electrical work, to Tri-Boro Serv. Electric Co., 596 21st Ave., Paterson, $3,425. Grand total $105,340. Noted May 14.

N. Y., New York—Bd. Educ., 500 Park Ave., general contract addition to P. S. 52, to Seaman Constr. Co., 145 West 27th St., $248,115. Noted May 14.

O., Bluffton — Bd. Educ., Bluffton-Richland School Dist., A. D. Hall, clk., 3 story, basement, 81 x 194 ft., brick, steel, concrete high school, to C. A. Degner, Inc., 221 Wade St., Toledo. $101,000. Noted June 4 Daily.

O., Cleveland—Ohio College of Chiropody, L. E. Siemon, 1612 Euclid Ave., 4 story, basement, 40 x 80 ft., brick, steel, concrete college, 2057 Cornell Rd., to Minton-Scobell Co., The Arcade. Est. $150,000.

THEATRES

PROPOSED WORK

Calif., Stockton—Bliss & Fairweather, Balboa Bldg., San Francisco, soon lets contract Class A rein.-con. theatre, Main St., for National Theatres Syndicate, 25 Taylor St., San Francisco, $400,000. Noted Mar. 12.

N. Y., New York—Fox Theatres Corp., 850 10th Ave., theatre, 731 Lexington Ave. $1,000,000. Project in abeyance until late 1932. Noted Dec. 25.

N. Y., New York—N. J. Nicholas, 70 East 45th St., 25 story theatre, apartment, $2,500,000. H. C. Ingalls, 347 Madison Ave., archt. **Maturity about October.** Noted Nov. 14, 1929.

N. Y., New York—Shubert Theatre Corp., 225 West 44th St., theatre and store, 233 West 44th St. $200,000. H. J. Krapp, 1 West 47th St., archt. Project in abeyance. Noted May 1, 1930.

N. Y., New York—B. S. Moss Theatres, c/o Colony Theatre, Bway. and 55th St., threatre, 8th Ave. and 23rd Sts. $1,000,000. **Maturity in winter or early spring.** E. DeRosa, 18 East 41st St., archt. Noted Oct. 2, 1930.

N. Y., Plattsburg—Paramount Publix Theatres, Paramount Bld., general contract theatre, $150,000. Rapp & Rapp, Paramount Bldg., New York, archts. Project in abeyance until winter or later. Noted Jan. 15.

N. Y., White Plains—Warner Bros. Theatres, Inc., 312 West 44th St., New York, theatre, $150,000. **Maturity next winter.** J. Eberson, 370 Lexington Ave., New York, archt. Noted Mar. 3.

Theatres (Continued)

Vt., Burlington—Citizen's Theaters, Ltd., 21 Church St., brick, steel theater, Church St. $200,000. Architect not selected.

BANKS

PROPOSED WORK

Ala., Birmingham—First Natl. Bank plans by Graham, Anderson, Probst & White, 80 East Jackson Blvd., Chicago, Ill., bank. $500,000.

BIDS ASKED

N. Y., Olean—First Natl. Bank, 101 Union St., bids about February, bank addition. $150,000. W. Potter, 22 East 17th St., New York, archt. Noted Jan. 22.

OFFICES

PROPOSED WORK

Ill., Chicago—W. J. Rayburn, et al., 38 South Dearborn St., will not build 5 story, basement, 48 x 165 ft., rein.-con., brick office, store, Cicero Ave. and Madison St. $300,000. Project abandoned. Noted Sept. 4.

BIDS ASKED

Ill., Chicago—July 7, by Graham, Anderson, Probst & White, archts., 1417 Railway Exchange, Field Building, 25 story, sub-basement, tower, 189 x 322 ft., brick, steel, stone, La Salle, Adams and Clark Sts., for Marshall Field Estate, 232 South Clark St. $12,000,000. Noted Feb. 26.

N. Y., New York—See "Contracts Awarded."

CONTRACTS AWARDED

Ill., Chicago — Marshall Field Estate, 232 South Clark St., 25,000 tons structural steel for Field Building, 25 story, sub-basement, tower, 189 x 322 ft., brick, steel, stone, La Salle and Adams Sts., to McClintic-Marshall Co., Oliver Bldg., Pittsburgh, Pa. Soted Feb. 26.

N. Y., New York—H. Mandel, 10 East 40th St., 21 story, brick, steel store, office, 38 East 40th St., day labor and separate contracts. $1,000,000. **Maturity in spring, 1932.** Farrar & Watmough, 10 East 40th St., archts. Noted Nov. 21, 1929.

STORES

PROPOSED WORK

Mass., Northampton — H. I. Shackly, c/o Krokyn & Browne, archts., 120 Milk St., Boston, 1 story, basement, 125 x 135 ft., brick, stone store, West and Green Sts. $150,000.

N. Y., Albany—Schulte United, Inc., 485 5th Ave., New York, will not build department store. $500,000. Project abandoned. Noted May 1, 1930.

N. J., Asbury Park—Bd. City Comrs., City Comrs., City Hall, bids in fall, rebuilding 2 story, basement, brick, steel store and bath house, adjoining convention hall between 4th and 5th Sts. $250,000. Warren & Wetmore, 16 East 47th St., New York, archts. Noted May 21.

N. J., Caldwell—M. Corte, c/o E. R. Coe, archt., 136 Washington St., Paterson, bids in July, general contract 2 story, basement, 60 x 125 ft., brick, steel store, office. $150,000. Noted June 11.

N. J., East Orange—M. Keating, c/o Mahnken & Schultz, archts., 256 Summit Ave., Union City, sketches 2 story, basement, brick, steel store, office, Central Ave. $150,000.

N. J., Newark—C. L. Steinbrenner, archt., 50 Pope Ave., soon lets general contract 1 story, basement, brick, steel store, 1031 South Orange Ave., for F. Schlather, 1029 South Orange Ave. $150,000. F. W. Woolworth Co., 661 Broad St., lessee.

N. J., Union City—Owner, c/o P. A. Vitarttas, archt., 110 48th St., sketches 2 story, basement, 75 x 100 ft., brick, steel store, office, 36th St. and Bergenline Ave. $150,000.

N. Y., New York—Verschleiser Armory Corp., 1440 Bway., will not alter armory into sports arena, store and convention hall, 68th St. and Bway. $1,000,000. Project abandoned. Noted May 8, 1930.

N. Y., New York—Ella E. Wendell Estate, 175 Bway., plans by J. B. Sneck & Sons, 52 Vesey St., 7 story, 20 x 75 ft. store, office, showroom, 533 West St. $150,000.

N. Y., New York—John Daniells & Sons, 759 Bway., 23 story store, apartments, 759 Bway. $3,000,000. **Maturity probably fall 1932.** Noted Nov. 14, 1929.

N. Y., New York—H. S. Helfer Department Store, Burnside and Walton Aves., will not build department store, 170th St. and Jerome Ave. $150,000. Project abandoned. Noted Oct. 16.

BIDS ASKED

N. J., East Orange—Owner, c/o E. C. Epple, archt., 17 Washington St., bids about July 1, general contract 2 story, basement, brick, steel store, office, apartment, Dodd and Prospect Sts. $150,000. Noted June 4.

N. J., Paterson—J. Bellomo, archt., 6 Park Ave., bids about July 1, general contract 2 story, basement, irregular sized, brick, steel, store, office, storage, comfort station, Island Market Sect., for Island Market Corp., P. Alfano, 7 Bank St. Est. $150,000. Noted June 4.

N. Y., Brooklyn—See "Contracts Awarded."

CONTRACTS AWARDED

N. Y., Brooklyn—Wilna Realty Co., L. Posner, sec., 16 Court St., 6 story, Ocean Parkway, Webster and Newkirk Aves., separate contracts. $400,000. Cohn Bros., 215 Montague St., archt. Noted June 4.

PUBLIC

PROPOSED WORK

Mass., Norfolk — PRISON COLONY — Commonwealth of Massachusetts, Dpt. Correction, State House, Boston, plans by McLaughlin & Burr, 88 Tremont St., Boston, and soon takes bids 3 story, basement, 35 x 155 ft., brick, rein.-con., receiving building, concrete found., at State Prison Colony. $250,000. Noted May 7.

Mass., Springfield—LIBRARY—City Library Assn., H. C. Wellman, 285 Rimmon Ave., branch library, State St., $150,000-$200,000. Architect not selected.

Mass., Springfield — NATURAL HISTORY MUSEUM—City, Library Assn., bids about July, natural history museum. $160,000. E. L. Tilton, 420 Lexington Ave., New York, archt. Noted May 14.

N. J., Caldwell—LIBRARY—Bd. Boro Comrs., City Hall, revised sketches by Guilbert & Betelle, 20 Branford Pl., Newark, 2 story, basement, brick, steel library and civic center, Westfield and Roseland Aves. $150,000. Noted Apr. 30.

N. J., East Arange — ARMORY — Dpt. Institutions & Agencies, State Office Bldg., Trenton, will not build artillery armory addition. $50,000. Project abandoned. Noted May 18.

N. J., Keyport — MUNICIPAL — Bd. Town Comrs., Town Council, will not build 2 story, basement, brick, steel, Main St. $150,000. Project abandoned. Noted Mar. 5.

N. Y., Mount Kisco—FIRE HOUSE, etc.—Village, fire house and municipal building. $150,000. J. W. Schmidt, 1440 Bway., New York, archt. **Maturity probably early in July.** Noted Jan. 22.

Pa., Phila.—COURT—Bd. Comrs. Philadelphia Co., G. F. Holmes, pres., plans by J. T. Windrim, Commonwealth Bldg., and bids about June 25, brick, steel, rein.-con. municipal court building, Parkway St. $325,000. This corrects report in Mar. 12 issue.

Que., Montreal—CONVENTION HALL—City Council, A. Weldon, chn. com., convention hall. $500,000.

Que., Verdun—CITY HALL—City Council, new hall. $200,000.

BIDS ASKED

Mass., Springfield—MUSEUM—Gray Art Museum and City Library Assn., bids about July 15 or later, general contract art museum, State and Chestnut Sts. $350,000. E. L. Tilton, 420 Lexington Ave., New York, archt. Noted May 14.

N. J., Caldwell — BORO HALL — Bd. Boro Council, bids about July 15, 2 story, basement, brick, steel, rein.-con. $175,000. Guilbert & Betelle, 20 Branford Pl., Newark, archts. Noted May 28.

O., Cleveland—DETENTION HOME, etc.—July 2, by Juvenile Courts Building Comn., J. H. Harris, chn., Court House, 3 story, 40 x 230 ft. juvenile court building, 3 story, 40 x 165 ft. departments building, 3 story, 40 x 230 ft. delinquents building, and 2 story, 30 x 165 ft. service building, all foregoing rein.-con., East 22nd St. and Central Ave. $1,650,000. F. W. Bail Co., Hanna Bldg., archts. Noted Mar. 12.

Ore., Medford—COURT HOUSE—Jackson Co., L. B. Humphreys, supt., Court House, bids about Aug. 1, 4 story, basement, rein.-con., Court House Sq. $265,000. Dougan & Beaverman, Kraemer Bldg., Portland, archts.

CONTRACTS AWARDED

Minn., St. Paul — CITY HALL and COURT HOUSE—City and Ramsey Co., G. Bundlie, chn. building com., general contract 2 story, basement, brick, steel, city hall and court house, to Foley Bros., 209 Gilfillan Blk., $2,221,400; plumbing and heating, to Healy Plumbing & Heating Co., 278 West 4th St., $215,990. Noted May 14.

UNCLASSIFIED

PROPOSED WORK

Calif., Sacramento — ORPHANAGE — Roman Catholic Archbishop plans by H. J. Devine, California State Life Bldg., 2 story, basement, rein.-con. orphanage, Franklin Blvd. $250,000.

Mass., Boston — POSTAL STATION — McLaughlin & Burr, archts., 88 Tremont St., soon lets contract altering postal station, incl. elevator, machine shop, 735 Atlantic Ave., Beach St., for Owner, c/o Architects, U. S. Govt. lessee.

Neb., Lincoln—PUBLISHING—State Journal Co., J. C. Seacrest, pres., 9th and P. Sts., sketches 4 story, 70 x 142 ft. newspaper publishing plant, brick, concrete, 13th and L Sts.

N. J., Hackensack — DANCE HALL, etc. — Lakeside Estates, Inc., 210 Main St., will not build 2 story, basement, brick, steel dance hall, amusement center, Main St. $180,000. Project abandoned. Noted May 7.

N. J., Rumson—EXCHANGE—New Jersey Bell Telephone Co., 540 Broad St., Newark, will not build telephone exchange. $150,000. Project abandoned. Architect not selected. Noted June 4.

N. J., West Long Branch—MAUSOLEUM—Glenwood Mausoleum Assn., B. P. Morris, pres., revised plans by G. B. Webb, 10 East 43rd St., New York, 1 story, basement, brick, steel mausoleum. $250,000. Noted Apr. 17.

N. Y., New York — RESTAURANT, etc. — Earl Carroll and 755 7th Ave. Corp., 7th Ave. and 50th St., 40 story, restaurant and commercial building, 7th Ave. and 50th St. $1,000,000. G. E. Keister, 56 West 45th St., archt. Project in abeyance. **Maturity in 1932 or later.** Noted Apr 16.

Pa., Pittsburgh—MEDICAL—Amer. Medical Buildings Co. Ltd., R. C. Bowman, in charge, Loews Pennsylvania Bldg., plans by G. H. Wiemeyer, 910 James O'Viatt Bldg., Los Angeles, Calif., 25 story, 120 x 128 ft., brick, stone, concrete, steel medical building, garage, store, Pennsylvania Ave. $1,000,000.

BIDS ASKED

Mo., St. Louis—PUBLISHING—Star Publishing Co., 12th and Olive Sts., bids about July 9, 5 story newspaper publishing plant, F. D. Chase, Inc., 720 North Michigan Ave., Chicago, Ill., archts. Noted Oct. 2, 1930.

N. Y., Jamestown—PASSENGER STATION—June 25, by Erie R. R. Co., G. S. Fanning, ch. engr., 50 Church St., New York, 1 and 2 story, brick, steel concrete passenger station. $250,000.

CONTRACTS AWARDED

Calif., San Francisco — WAR MEMORIAL OPERA HOUSE, etc.—Bd. Trustees San Francisco War Memorial, concrete and cement work for 4 story, basement was memorial, 6 story, basement opera house, to MacDonald & Kahn Financial Center Bldg., $521,000; granite work, to McGilvray-Raymond Corp., 3 Potrero Ave., $274,457, if set against concrete backing, $276,257, if set before backing is poured. Noted Apr. 9.

Ill., Joliet—EXCHANGE—Holabird & Root, archts., 333 North Michigan Ave., general contract and mechanical trades, 3 story, basement, 94 x 111 ft., rein.-con., brick, steel, plain found., to Kaiser-Ducet Co., Joliet, for Illinois Bell Telephone Co., 212 West Washington St., Chicago. $400,000. Noted May 14.

Mich., Detroit — MERCANTILE — Whitney Realty Co., 1835 David Whitney Bldg., 8 story, basement, 60 x 100 ft., brick, steel, stone, rein.-con., plain found., Woodward Ave., to Otto Misch Co., 159 East Columbia St.

N. H., Manchester — HISTORICAL — Manchester Historical Society, F. P. Carpenter, pres., historical building, to L. H. Shattuck, Inc., 208 Granite St. Noted June 4.

N. J., Jersey City—HOME—Hebrew Home for Orphans & Aged, 161 Summit Ave., general contract 2 story, basement, 40 x 100 ft., brick, steel home for aged, to C. Barbash, 3010 Hudson Blvd. Est. $150,000. Noted May 7.

N. Y., Yonkers — PUBLISHING — Yonkers Statesman Corp., 55 Main St., general contract publishing plant, Larkin Plaza, to F. T. Ley & Co., 578 Madison Ave., New York, steel, to Levine Iron Wks., 955 Saw Mill Rd., excavation and found., to Pier Steel Pile Constr. Co., c/o owner; elevators, to Otis Elevator Co., Yonkers. Est. $170,000.

Pa., Phila—STATION—Pennsylvania R.R. Co., Broad St. Sta., T. J. Skillman, ch. engr., 3 story, basement, 172 x 327 ft., rein.-con. steel, granite, limestone, caisson found., to United Engineers & Constructors Inc., 112 North Broad St. Contractors will take sub-bids.

Industrial Buildings

FACTORIES AND MILLS

PROPOSED WORK

Conn., Middlefield—COLD STORAGE PLANT—Lyman Farms, plans by L. J. Thompson, 521 Corbin Ave., New Britain, 1 story, concrete cold storage plant for fruit. $45,000.

Conn., Southington—COLD STORAGE PLANT—Lakeview Farm, H. Rogers, mgr., plans by L. J. Thompson, 521 Corbin Ave., New Britain, 1 story, concrete cold storage plant for fruit. $40,000.

Ind., Terre Haute—PLANT—Highland Iron & Steel Co., 28th St. and 4th Ave. (subsidiary American Chain & Steel Co., Chicago, Ill.), sketches new plant unit. J. Schlossberg, plant mgr.

N. J., Kearny (sta. Arlington)—FACTORY—Western Electric Co., Lincoln Hy., three 7 or 8 story, basement, brick, steel factory buildings, Central Ave. $500,000. Project indefinitely in abeyance. Noted Apr. 3.

N. J., Millburn — DRESS FACTORY — P. Masella, 40 Main St., 2 story, basement, 45 x 70 ft., brick, steel. $40,000. Bids in. Project in abeyance. E. P. Bonnett, 363 Bloomfield Ave., Montclair, archt. Noted May 7.

N. J., Newark—MANUFACTURING PLANT—Bd. City Comrs., City Hall, 1 story basement, 100 x 140 ft., brick, steel, concrete block, Port Newark. $40,000. Reliable Box & Lumber Co., 65 Avenue A, lessee.

N. Y., Brooklyn—DAIRY PLANT—Beatrice Creamery Co., 1526 South State St., Chicago, Ill., subsidiary Jersey Maid Ice Cream Co., 32 Little Nassau St., dairy plant, 32 Little Nassau St. To exceed $200,000. **Maturity about October.** Private plans. Noted June 4.

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Factories and Mills (Continued)

N. Y., Brooklyn—FACTORY—Thames Trading Co., 47 Thames St., plans by S. Goldsmith, 4914 Church Ave., 4 story, 100 x 200 ft., Bogart St. and Harrison Pl. $250,000.

N. Y., Brooklyn—RUBBER FACTORY—Rand Rubber Co., Halsey St. and Sumner Ave., sketches by M. Marlo, 200 Beverly Rd., altering and constructing 3 story addition, Halsey St. and Sumner Ave. $40,000 incl. equipment.

N. Y., Flushing—DRY CLEANING PLANT—J. T. Watson, Barclay St., plans by P. Coco, 433 Steinway Ave., Long Island City, 1 story, 50 x 80 ft., 30th Ave. and 170th St. $40,000.

N. Y., Maspeth—FACTORY—Circle Flexible Co., 24-44 Woodward Ave., sketches by S. Goldsmith, 4914 Church Ave., Brooklyn, 1 story, 94 x 100 ft., Woodward and Flushing Aves. $40,000.

N. Y., Ridgewood—FACTORY—Stahl-Meyer Co., Wyckoff Ave. and Cody St., sketches by Allmendinger & Schlendorf, 852 Monroe St., Brooklyn, 1 story, basement, 116 x 118 ft. addition. To exceed $40,000.

Okla., Picher—MILL—Eagle Picher Mining & Smelter Co., mill, $400,000.

Pa., Phila.—MANUFACTURING—Boyertown Burial Case Co., E. L. Mory, pres., 1211 Architect St., soon lets contract 3 story, basement, 34 x 112 ft., brick, steel, plain found., Florist and Juniper Sts. $75,000. Private plans.

Tex., Brownsville—PLANING MILL—J. R. Box, San Angelo, 1 story, brick, rein.-con., plain found. Architect selected soon.

Tex., Harlingen—PACKING and FREEZING PLANT—Texas Frozen Juice Corp., Harlingen (company being formed), packing and freezing plant for citrus fruit, 300 cars fruit a season. $65,000.

Tex., Hillsboro—ICE PLANT—W. S. Grimes & W. D. Little, Hillsboro, and Fort Worth, 1 story, 60 x 90 ft., concrete, steel plant. $60,000. Noted May 21.

Va., Norfolk—FACTORY, etc.—Amer. Peanut Co. rebuilding 5 story brick factory, warehouse, Water St., recently destroyed by fire. $100,000.

Alberta, Calgary — PRINTING PLANT — Prarie Liberator Ltd., J. J. Maloney, pres., Biggar, Sask., plant. $50,000, incl. equipment.

Ont., Guelph—PLANT—Sunshine Products of Canada, Ltd., T. H. Orr, pres., plant for manufacture of liquid wax polished, oils, etc. $50,000.

Ont., Hamilton—REFINING PLANT—Pennsylvania Refining Co., Ltd., refining plant. $100,000.

BIDS ASKED

Calif., Oakland — LAUNDRY — Miller & Warnecke, archts., Financial Center Bldg., taking bids 1 story, mezzanine, 175 x 280 ft., brick, steel, 29th St. for Oakland Laundry Co., 730 29th St. $250,000, incl. equipment. Noted June 4.

Mass., Quincy—DAIRY—White Bros., 50 Brooks St., taking bids altering and constructing 1 story, brick, concrete, steel addition, plain found. $40,000. W. E. Luke, 24 Carle Rd., archt.

Mass., Taunton — FACTORY — June 19, by Taunton Pearl Wks., 35 Vernon St., 2 story, basement, brick, timber, plain found. $50,000. Jackson & Moreland, 31 St. James Ave., Boston, archts. Noted June 4.

N. J., New Brunswick — CLOTHING FACTORY—H. G. Bach, archt., 63 Schureman St., taking bids 3 story, basement, 75 x 200 ft., brick, steel addition, Remsen Ave., for Aplo Clothing Co., Remsen Ave. $125,000. Noted June 11.

N. J., Maplewood—GOLF CLUB FACTORY—Kroydon Co., Burnet Ave., taking bids general contract 1 story, basement, brick, steel, rein.-con. addition. $40,000. D. A. Hopper, 22 Ridgewood Ave., Irvington, archt.

N. Y., Brooklyn—FACTORY—National Saw Dust Co., 69 North 6th St., taking bids general contract 2 story, basement, 25 x 100 ft., North 6th St. and East Kent Ave. $40,000. Laspia & Samenfeld, 217 Havemeyer St., archts. Noted June 4.

N. Y. Brooklyn — LAUNDRY — Brighton Laundry Co., 587 Sheepshead Bay Rd., bids about July, general contract altering 2 story laundry, 587 Sheepshead Bay Rd. $40,000. J. M. Fenichel, 468 4th Ave., New York, archt. Noted June 4.

N. Y., Brooklyn—LAUNDRY—Walsof Corp., H. Boslow, pres., bids about July 1, altering laundry, West 6th St. and Sheepshead Bay Rd. $40,000. I. M. Fenichel, 468 4th Ave., New York, archt.

N. Y., Brooklyn—FACTORY—See "Contracts Awarded."

Pa., Titusville — DAIRY — Titusville Dairy Products Co., H. Rabild, pres. and mgr., taking bids 1 story, 15 x 20 ft. and 20 x 20 ft., concrete, brick, steel addition for boiler house, South Washington St. Also plans other unit to mature in fall. Braziell & Anderson, 309 4th Ave., Pittsburgh, archt. Noted May 28.

CONTRACTS AWARDED

N. Y., Brooklyn — FACTORY — New York Yock Co., 44 Whitehall St., New York, altering 3 story manufacturing and storage, Beard and Conover Sts., also elevator shafts in warehouse, Furman Ave. and Joralemon St., separate contracts and day labor. $40,000. L. E. Driver, 334 Furman Ave., archt.

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O., Ashtabula — MILLS DISTRIBUTING PLANT—Telling Belle-Vernon Co., 3825 Cedar Ave., Cleveland, A. F. Gleim, engr. constr. 1 story, 50 x 150 ft., brick- steel, to Johnson & Ericson, Lake St. Est. $60,000. Noted June 4.

O., Cleveland — ASSEMBLY PLANT — J. B. Perkins, 1 and 2 story, 155 x 220 ft. assembly building and 46 x 155 ft. office, brick, steel, concrete, 6,400 Herman Ave., to H. K. Ferguson Co., Hanna Bldg. Est. $200,000. Electric Storage Battery Co., 19th St. and Allegheny Ave., Phila., Pa., lessee.

R. I., Woonsocket—DYEING and CLEANSING PLANT—Falk Bros., 35 Main St., 1 and 2 story, brick, plain found., Social St., to Frederick & Pelletier, 515 Providence St. Est. $40,000. Noted May 21.

Tex., Amarillo — BAKERY PLANT — Grant Baking Co., c/o J. Grant, Tulsa, Okla., rein.-con., tile, stucco, plain found., to C. J. Patterson Corp., 4050 Penn St., Kansas City, Mo., $125,000.

GARAGES

PROPOSED WORK

Mass., Salem—Estate of M. M. Creedon, 428 Essex St., revised plans by Andrews, Jones, Biscoe & Whitemore, 50 Congress St., Boston, 1 story, brick, concrete, steel garage addition, plain found., Essex St. $40,000. Former bids rejected. Noted May 21.

N. J., Jersey City—J. Goldenberg, 80 Woodland Ave., 15 story, basement, brick, steel garage. $500,000. **Maturity about September.** C. Shilowitz, 26 Journal Sq., archt. Noted May 14.

N. Y., Brooklyn—H. S. Burnham, 215 West 75th St., New York, plans by W. Shary, 22 East 17th St., New York, 100 x 160 ft. garage and storage, Gravesend Ave. and Avenue J. $40,000.

N. Y., Brooklyn—P. S. Glickman, 1498 Bway., sketches by H. J. Nurick, 44 Court St., 100 x 200 ft. service garage, 23rd Ave. and 59th St. To exceed $45,000.

N. Y., Brooklyn—M. S. Kaplow, 3114 Avenue M, 2 story, basement service garage, West 4th St. and Avenue P. $40,000. I. Kallich, 375 Fulton St., archt. **Maturity late in fall.** Noted June 4.

N. Y., Brooklyn—Rae Arone, 1669 45th St., gas station, service garage, 17th Ave. and 62nd St. $40,000. **Maturity about October.** Kallick & Weinstein, 375 Fulton St., archts. Noted June 4.

N. Y., Brooklyn—M. Tucker, 120 Magnolia Ave., Floral Park, sketches by M. Hirsch, 350 Stone St., 90 x 150 ft. service garage, Crystal St. and Liberty Ave. $40,000.

N. Y., Jamaica—P. Fantina, 160-19 107th Ave., sketches by E. Guterman, c/o owner, 1 story, 87 x 116 ft., brick, steel, service garage, Merrick Rd. and 107th Ave., $40,000.

Pa., Pittsburgh — *See* "Buildings — Unclassified."

BIDS ASKED

Indiana — June 20, by National Autohaven Co., 201 North Wells St., Chicago, Ill., 85 x 88 ft., brick, steel superservice stations in West Lafayette, Warsaw, Valparaiso, Tremont, Kentland, Goshen, Columbia Lity and Angola. $50,000. Private plans.

Indiana—June 20, by National Autohaven Co., 201 North Wells St., Chicago, Ill., fourteen 3 story, basement, 85 x 88 ft., brick, steel, stone super service stations, one each in Frankfort, Attica, Auburn, Decatur, Crawfordsville, Ft. Wayne, Gary, Hammond, Huntington, Kendallville, Kokomo, Marion, Michigan City, and Mishawaka. $50,000 each. Private plans.

CONTRACTS AWARDED

Mass., Edgartown—G. L. Marchant, Robinson St., 2 story, brick, concrete, steel garage, storehouse, plain found., Robinson St., to F. L. Norton & Son, Edgartown. Est. $40,000.

Mass., Hingham—Town, W. L. Foster, chn. Bd. Selectmen, 1 story concrete garage and storage, to A. Higgins, New Bridge St. Est. $40,000. Noted Apr. 30.

Ill., Chicago—Commonwealth Edison Co., 72 West Adams St., masonry contract 1 story, 50 x 71 ft. sub-station, 3147-49 Harrison St., to T. G. Gage, 64 West Randolph St. Est. $40,000.

SHOPS AND FOUNDRIES

CONTRACTS AWARDED

N. Y., Long Island City—SHOP—Dpt. Water Supply, Gas & Electricity, Municipal Bldg., New York, general contract shop, headquarters for 1st Repair Company, to F. S. Pizza Co., Princeton St., Jamaica $43,000, electrical work, to E. Hellman $1,595, plumbing, to T. F. Mulligan, 45-28 11th St. $3,250; heating, to Murphy Beaumont, 303 West 42nd St., New York, $2,763; steam piping in east boiler room, Millburn Pumping Station, to Dierks Heating Co., 210 East 31st St., New York, $8,493. Grand total $59,101. Noted May 28.

Ia., Oelwein—SHOPS—See "Warehouses."

POWER PLANTS

PROPOSED WORK

N. J., Irvington—Public Serv. Electric & Gas Co., Terminal Bldg., Newark, 1 story, basement, brick, steel power plant. $40,000 or more. **Maturity probably soon.** Private plans.

N. D., Fargo—State Bd. Administration, E. G. Wanner, secy., Bismarck, improving and altering central heating plant, incl. 400 hp. standing type boiler, traveling gate stoker, coal handling equipment, constructing 125 ft. smoke-stack for State Agriculture College. $50,000. Fuel Economy Eng. Co., 400 Anchor Insurance Bldg., St. Paul, Minn., engrs.

Okla., Supply—See "Hospitals."

BIDS ASKED

Me., West Peru—Berst, Foster Dixfield Co., F. W. Smith, mgr., taking bids 2 story, mezzanine, 60 x 112 ft., brick, steel, power house and pump house. $40,000 or more. H. F. Hallock, Oswego, N. Y., archt.

Minn., Litchfield—June 22, by Village, M. Mortenson, recdr., 750 kw. steam turbine generating unit with condenser, generator, cooling tower, alternate on unafloat reciprocating engine and generator unit. $55,000. Wolff & Coates, 903 Globe Bldg., St. Paul, engrs.

Neb., Holdredge—June 25, by I. Anderson, city clk., one 600 kw. turbo-generator erected surface condenser, erected; switchboard panel, f.o.b. cars Holdredge; cooling tower, 1,360 g.p.m., erected; sump pump, f.o.b. cars Holdredge; feed water regulator, f.o.b. cars Holdredge; 315 hp. superheater erected. $40,800. Black & Veatch, 701 Mutual Bldg., Kansas City, Mo., engrs.

S. D., Vermillion — June 29, by City, E. A. Lenhart, aud., municipal electric light and power plant, incl. engines and generators, switchboard, motor-driven exciter, and auxiliary electric equipment, heating, plumbing and full handling system. $85,000. C. A. Trimmer, Madison, engr. Noted Apr. 9.

Vt., Bennington—State, H. T. Johnson, taking bids 1 story, heating plant, incl. radial chimney, 2 new boilers. $50,000. F. L. Austin, 240 College St. archt and A. S. Kellogg, 585 Boylston St., engr., both Boston, Mass.

CONTRACTS AWARDED

Kan., Fredonia—O. C. Wilson, city clk., 600 kw. oil engine generating unit and auxiliaries, to Nordog Engine Co., Milwaukee, Wis., $42,000. Noted Mar. 14.

Mich., Detroit—Bd. Water Comrs., Water Bd. Bldg., 735 Randolph St., Steam piping in Springwells Power Plant, to Freyn Bros., 3850 Michigan Ave., $156,781. Noted Apr. 23.

N. Y., Watertown—Beebe Island Corp., G. S. Knowlton, pres., c/o Knowlton Bros. Paper Co., 213 Factory St., power development, two 5,000 hp. units, to F. T. Ley & Co., Inc., 1215 Main St., Springfield, Mass., $591,000. Noted Apr. 23.

Que., Montreal—Sisters of the Grey Nuns, 62 x 100 ft. power house, Queen Mar Rd., to A. Deschamps, 156 Maplewood Rd., $66,000.

WAREHOUSES

PROPOSED WORK

Mass., Brighton (sta. Boston)—International Harvester Co. of America, 606 South Michigan Ave., Chicago, Ill., soon lets contract 1 story, 85 x 195 ft., brick, steel, rein.-con. storage building and service station addition, concrete found., Everett and Beacon Sts. $50,000 or more. Private plans.

N. J., Paterson—Great Atlantic & Pacific Tea Co., Sherman Ave., soon lets contract Newark, general contract 1 and 2 story, basement, 125 x 285 ft., brick, steel, rein.-con. warehouse addition, Railroad Ave. $150,000. Private plans.

N. Y., Brooklyn — City of New York, c/o Sclafani Bros., lessee, 1032 Wallabout Market, plans by C. P. Cannella, 1163 Herkimer St., 2 story, 40 x 125 ft. storage and industrial building, Fleetman Ave. and D St. $40,000.

N. Y., New York—Manhattanville Realty Co., 526 11th Ave., 12 story, 74 x 100 ft., brick, steel, 526 11th Ave. $400,000. O. L. Spanshake, 116 Nassau St., archt. Project in abeyance until winter or later. Noted May 1.

N. Y., New York—Shire Realty Corp., 26 Court St., 4 story storage, 120 Bway. $150,000. **Maturity indefinite.** G. and E. Blum, 415 Lexington Ave., archts. Noted Sept. 25.

N. Y., New York—Star Co., 220 South St., will award contract about July 1, 3 story warehouse, factory, 419 Water St. $175,000. Bids in. Lockwood, Greene & Co., 100 East 42nd St., New York, engrs. Noted Apr. 9.

N. Y., West New Brighton—Tanner & Gross, 25 Beaver St., New York, general contract 7 story, brick, steel warehouse, $150,000. Project in abeyance. R. G. Cory, 30 Church St., New York, archt. Noted Jan. 22.

Pa., Erie—General Electric Co., D. F. Smith, genl. supt. East Lake Rd., soon lets contract 1 story, brick, steel warehouse, East Lake Rd. Private plans.

Pa., Warren—Emblem Oil Corp., c/o United Refining Co., Union Citiy, soon lets contract 1 and 2 story, 50 x 120 ft., brick, concrete, stucco warehouse and office. $40,000. Beck & Tinkham, Bailey Bldg., Jamestown, N. Y., archts.

Tex., Galveston—Cotton Concentration Co., 3 story, 330 x 360 ft., rein.-con. storage shed. $80,000. Private plans.

Va., Norfolk—See "Piers and Wharves."

Va., Norfolk—See "Factories and Mills."

BIDS ASKED

Calif., Oakland—City Port Comn., 424 Oakland Bank Bldg., bids about June 22, Warehouse C, rein.-con., Outer Harbor. $225,000. Noted Feb. 5.

Ia., Oelwein—See "Contracts Awarded."

CONTRACTS AWARDED

Ia., Oelwein — Chicago Great Western R.R. Co., 403 Grand Central Station, Chicago, Ill., C. G. Delo, ch. engr., remodeling, extending 6 stalls to brick, concrete round house, own forces.

See proposal advertising on page 87